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WORLD'S POULTRY SCIENCE ASSOCIATION

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XIITH WORLD'S POULTRY CONGRESS
REPORT OF GROUNDS & EXHIBITION COMMITTEE

The planning of the Commercial, National, and Live Poultry Exhibitions, to be staged at the XIIth World's Poultry Congress, is making good progress under the virile guidance of the Grounds and Exhibitions Committee headed by Chairman, Otto Moll.

Spacious modern exhibition buildings on the grounds of the site have been selected and space is now being allocated for the various purposes required.

Information and application forms for exhibition space are being prepared and shortly will be forwarded to all interested in the Trade and Commercial Exhibition section. Trade Exhibitors throughout the world will be invited to exhibit at this important International Congress and a most extensive and representative Trade Exhibition is assured.

Two large Pavilions have been set aside for the exhibition of Live Poultry, which is restricted only to Poultry bred in Australia. Exhibitions of Live Poultry are popular in Australia, and active Poultry Clubs are established everywhere. About 5,000 birds of almost all known breeds will be exhibited in competitive classes.

It is planned to set aside one modern Pavilion for the Australian National Exhibit—which will be of an educational nature depicting the Industry at work and the Services supporting it.

A leading Australian Public Relations Organisation, widely experienced in Large Trade Exhibitions, has been retained to organise and administer Exhibitions with the Committee appointed for this task.

Visitors to the Congress are assured of interesting Exhibitions of a most modern and extensive nature—the Committee concerned is working hard to make this section of the Congress something to be long remembered and in keeping with the importance of a World's Poultry Congress.

Business firms and organisations interested in the Trade Exhibition Section are invited to write direct to Industrial Public Relations Ltd., Royal Agricultural Showgrounds, Moore Park, Sydney, for full details of this section.

CANADIAN COMMITTEE FOR TWELFTH WORLD'S POULTRY CONGRESS

Plans for Canadian participation in the Twelfth World's Poultry Congress were inaugurated at an organization meeting held in Saskatoon during September, 1960, at the time of the recent Annual Convention of the Canadian Hatchery Federation.

Appointments to the Canadian Congress Committee are as follows:

Congress Committee Chairman—A. D. Davey, Director, Poultry Division, Dept. of Agriculture, Ottawa.

Sub-Committee on Scientific Papers—Dr. A. Johnson, Dept. of Agriculture, Ottawa; Dr. D. Clandinin, University of Alberta, Edmonton; Prof. J. Biely, University of British Columbia, Vancouver.

Sub-Committee on Publicity—A. D. Davey, Dept. of Agriculture, Ottawa; H. B. Donovan, Canadian Poultry Review, Toronto; F. W. Beeson, Canada Poultryman, Vancouver.

Sub-Committee on Attendance and Travel—Prof. J. R. Cavers, Ont. Agric. College, Guelph; W. H. Pope, Poultry Commissioner, Dept. of Agriculture, Victoria, B. C.; Jacques de Broin, Pioneer Cafeteria Feeds, Maple Leaf Milling, Toronto.

Sub-Committee on Exhibits—A. D. Davey, Dept. of Agriculture, Ottawa; D. McQ. Shaver, Galt, Ontario; Ron Peel, Port Perry, Ontario.

It is planned that others may be added to these committees as the congress plans develop.

NEWMAN TRUST INTERNATIONAL POULTRY AWARD FOR 1960

The Secretary (Mr. John R. Harvey) of the Newman Trust International Poultry Award Committee announced that the Award in the United Kingdom was made to Dr. R. S. Gowe, Animal Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.

The Award consists of a handsome medal and £50 sterling. It is given for what in the opinion of the Award Committee,

meeting in the United Kingdom, is the most important contribution to poultry husbandry research published in the previous year, for the benefit of poultry husbandry. This is the first time the Award has been won by an Canadian research worker.

The Award was made to Dr. Gowe for his outstanding work in the realm of environment and poultry breeding problems—the value of a random bred control strain in a selection study and the design of poultry control strains.

The published work on which the award was made is as follows:

Gowe, R. S., A. S. Johnson, J. H. Downs, R. Gibson, W. F. Mountain, J. H. Strain and B. F. Tinney, 1959. Environment and poultry breeding problems. 4. The value of a random-bred control strain in a selection study. Poultry Sci. 38: 443-461.

Gowe, R. S., Alan Robertson and B. D. H. Latter, 1959. Environment and poultry breeding problems. 5. The design of poultry control strains. Poultry Sci. 38: 462-471.

1960 DISTINGUISHED SERVICE AWARDS IN THE BRITISH POULTRY INDUSTRY

The Poultry and Egg Producers of Great Britain initiated in 1953 the presentation each year of not more than three Awards for distinguished service in, or for, the poultry industry over a long period of years. The Award consists of a handsome bronze medal and parchment citing the Award.

Three Distinguished Service to the Poultry Industry of the United Kingdom Awards for 1960 were as follows:

Mr. R. G. Chalmers Watson of Drem, East Lothian, Scotland, for distinguished service in the fields of poultry breeding and marketing.

Dr. R. Coles, B.A., M.Sc. (Econ.), M.Sc. (Agric.), of the Ministry of Agriculture, Fisheries & Food, London, England, for distinguished service in the field of poultry advisory work.

Mr. J. G. Penny, M.B.E., J.P., F.P.A., of Crieff, Perthshire, Scotland, for distinguished service in the fields of poultry breeding and marketing.

THE EUROPEAN FEDERATION OF WORLD'S POULTRY SCIENCE ASSOCIATION BRANCHES

MAJOR IAN MACDOUGALL

Secretary & Assistant Treasurer, World's Poultry Science Association, Agriculture House, Knightsbridge, London, S.W. 1, England

SUMMARY

This Paper deals with the inception and formation of the Federation. To do this effectively it has been necessary to delve into the past, and to refer to the formation of the Association and the development of World's Poultry Congresses and W.P.S.A. Branches. The formal inauguration of the Federation will take place after the submission of this Paper. Thereafter, an opportunity will be afforded for discussion and the submission of suggestions.

To-day, the European Federation of the World's Poultry Science Association Branches, one of whose objects is to institute Regional Conferences, whenever necessary and possible, is being officially inaugurated. It is a singularly happy coincidence that the first Conference should be sponsored by our Netherlands Branch, in view of the fact that the Government of the Netherlands were the hosts of the first World's Poultry Congress in 1921.

I have been asked to recount the story of its conception and tell you something of its constitution and objects. To do this satisfactorily, it is necessary for me to delve into the past. I make no apology for doing so because it is surprising how few of our members to-day have any knowledge of the formation of our Association and its early history.

At a Congress and Exhibition held in St. Petersburg in 1899 a proposal was made that an International Poultry Association should be formed with the object of securing unity for common purposes among the Poultry Societies of the World. The suggestion was enthusiastically received, and the proposal was unanimously approved. When, however, it was further proposed by the Russians that the headquarters of the organization should be in their Country, difficulties became apparent. It was felt by many of the delegates that Russia, at that time, was too inexperienced and too remote for effective direction and organization. Be that as is may, no steps were taken by the Russians or anyone else to carry the proposal into effect.

Ten years later, in 1909, a further attempt was made to

form an international association. In that year an announcement appeared in a Belgian journal, Chasse et Peche, that a meeting was to be held during the Liege Poultry Exhibition of that year to consider the question of an International Association. No invitation to be present was received by any British Poultry Society or Individual. Subsequently, a report in the same publication recorded that a meeting had been held, attended chiefly by Belgian and German representatives. Shortly afterwards a letter was received by the late Sir Edward Brown stating that he had been appointed to represent England on the Council of the proposed Association. In acknowledging that letter, Sir Edward emphatically declined the appointment on the ground that it was England's business to appoint its own representative and that we were not prepared to be left out of preliminary proceedings in connection with international projects. Some other countries who had been ignored also stood outside; so that attempt eventually came to naught.

In the meantime, action had been taken in America. The rapid growth of poultry husbandry in Canada and the United States, and the expanding provision made for instruction and research in that subject at Agricultural Colleges and Experiment Stations, had opened a career and field of service to a considerable number of men and women. As far back as 1906 the formation of a Society consisting of those so engaged had been considered, but it was not until 1908 that the International Association of Instructors and Investigators in Poultry Husbandry was constituted at Cornell University. The term International did not mean the World, but just Canada and the United States. The first Secretary was the late Professor J. E. Rice of Cornell University. Professor Rice, who had been elected President of the Association, approached Sir Edward Brown, late in 1910, in regard to the formation of an international society consisting of those engaged as instructors and investigators in poultry husbandry throughout the World. That approach was made at the request of the members of the American Association, who realised that important research was being carried out in several countries and that much of the value of that work was being lost owing to the lack of effective dissemination and interchange of experience and knowledge. It appeared to them very desirable and important that results should be pooled and reports translated and made available to all engaged in similar

work. Eventually, as the result of an interchange of views between Sir Edward Brown and Professor Rice, it was decided to proceed with the formation of such an international organization. A conference, attended by representatives of Australia, Belgium, Canada, Cyprus, Denmark, England, France, Germany, India, Ireland, The Netherlands, Norway, Russia, Scotland, the United States and Wales, was held in London from 18th to 24th July, 1912, and on the first day the International Association of Instructors and Investigators in Poultry Husbandry, now known as the World's Poultry Science Association, was formally constituted. To these two far-seeing visionaries, Professor Rice and Sir Edward Brown, must be given the credit for the conception and birth of the Association, the former as architect, the latter as builder.

One of the most important decisions taken by the Association, if not *the* most important, was to proceed with the institution of World's Poultry Congresses.

In 1905 the International Institute of Agriculture was established in Rome by the generosity of King Victor Emmanuel III. It was felt that it would be a great step forward if the first Congress were to be held in Rome, especially if the interest and co-operation of the Institute could be secured. Through the influence of a member of the staff an approach was made to the Italian Government, who received the suggestion with favour. However, the outbreak of the war in Tripoli prevented the giving of an invitation.

The next approach was made to the Netherlands Government and eventually, in 1913, a cordial invitation was received and accepted for holding the First Congress in their country. It was decided that it should be held in 1916. Preparations went forward, and as late as three weeks before the outbreak of the First World War on 4th August, 1914, a meeting of the Congress Committee was held at the Hague. With the outbreak of the war all activities were discontinued. Some time after the Armistice in November, 1918, the Netherlands Government was again approached, and they renewed their previous cordial invitation. It was decided that the Congress should be held in 1921. Many doubts were expressed whether there would be sufficient response to justify the labour and costs involved, and not a few Governments withheld their support. It proved, however, a great success, and we shall always be grateful to the Netherlands Government for so successfully carrying through what was an untried enterprise.

Following upon that success the way of development was opened, and applications were at once tentatively received for future Congresses. Up to the outbreak of the Second World War, Congresses were held in Spain (1924), Canada (1927), England (1930), Italy (1933), Germany (1936), and the U.S.A. (1939). In September 1939, on the outbreak of war, the activities of the Association, including the publication of the World's Poultry Science Journal, were suspended, and were not resumed until 1945. The holding of Congresses was resumed in 1948 in Denmark. Subsequent Congresses have been held in France (1951), Scotland (1954), Mexico (1958), and the next is to be held in Australia in 1962.

Following upon the resumption of Congresses, the membership of the Association, which had dropped to a very considerable extent as a result of the Second World War, began to expand both numerically and territorially. That expansion has continued each year since 1948. No factor has contributed more to it than the development of Branches. To-day the total membership of the Association is approximately 3,355 made up as follows: Patrons, 11; Affiliations, 185; and Ordinary Members, 3,159.

The original suggestion for the setting-up of Branches came from Dr. W. P. Blount. In April 1946 he wrote to Dr. G. F. Heuser, who was then Secretary-Treasurer, suggesting that Regional Branches should be set up and that 25 per cent. of the annual subscription should be retained by the Branches for administrative purposes. Dr. Heuser thought the suggestion an excellent one. He passed the correspondence over to me to take such action as was necessary to forward the project. At that time there were quite a number of members who, like myself, felt it was not quite enough to subscribe annually and receive in return the World's Poultry Science Journal. They felt that in addition local activities should be encouraged and steps taken to increase membership.

A meeting was held on 23rd October, 1946, when it was decided to proceed with the formation of a United Kingdom Branch. A small Committee was charged with the formulation of rules. These were approved and the first annual general meeting was held on the 10th July, 1947. Other countries followed the example of the United Kingdom members and to-day there are 10 Branches in active operation and 5 in process of being formed. As some indication of the effect establishing Branches had on membership, the U.K. Branch

in 1946 had a membership of 96; to-day it is over 630. Branches are not confined to Europe, they are spread all over the world.

This continued expansion imposed on the Association the duty of ensuring that the venues of Congresses were, as far as possible, fairly distributed throughout the world. Until 1954, Congresses were held at intervals of three years. In 1957 we were unable to secure a host for the Congress which was due to be held that year and it had to be postponed until 1958, when the Mexican Government undertook the duty. Partly on account of that difficulty, and for more valid reasons, the interval between Congresses was extended from three to four years. The next Congress, as you know, is to be held in Australia in 1962, the Golden Jubilee of the Association.

The holding of these two Congresses so far from Europe was a source of considerable worry to me. I felt that the heavy cost involved in travelling such great distances would prevent a very considerable number of our members from attending the Congresses. In the case of Mexico my fears were fully justified, for there were only 23 from the United Kingdom and about the same number from the rest of Europe, including 14 from the U.S.S.R. I felt that if some action was not taken to maintain the interest of our European members in the work of the Association we would lose many of them.

In August 1957, I was one of a party of 80, all of whom were engaged in some capacity in the poultry industry in the United Kingdom, who paid a short visit to the Netherlands under the auspices of the B.O.C.M. As 90 per cent. of the party were members of the U.K. Branch, opportunity was taken to meet our brethren of the Netherlands on the evening of our arrival in a friendly get-together. I was one of the speakers and in the course of my remarks voiced my fears about the Congress position. I suggested that consideration might be given to the holding of Regional Conferences in between World's Poultry Congresses, that these conferences should be limited to 4 days, and that they should be shorn of social functions. I was very much encouraged by the enthusiastic support my suggestion received.

Subsequently, in March 1959, a Committee of the Association, which had been set up to consider the reorganization of Congresses, recommended in their Report that consideration might be given to the holding of Regional Conferences in between Congresses, stipulating that they should not be

held in years in which World Poultry Congresses were being held.

Shortly before that, the Fifth Conference of International Organizations for the Joint Study of Programmes and Activities in the Field of Agriculture in Europe, convened and sponsored by the Food and Agriculture Organization of the United Nations, was held in Paris from 27th to 31st January. At that meeting the desire was expressed that close liason should be established between international organization in Europe interested in problems of the poultry industry. With that end in view, the Director-General of the F.A.O. summoned a meeting, which was held in Rome on 21st and 22nd May. Invitations were sent to seven European Organizations, including the Association. In addition, invitations were extended to representatives from the following countries: Belgium, France, Germany, Italy, The Netherlands and Switzerland, all of whom were members of the Association. At the request of our President I attended as representative of the Association. In view of the presence of all these members, the opportunity was taken of holding a meeting to discuss the question of Regional Conferences. To do this it was essential that some organization should be set up under whose aegis these Conferences could be arranged. It was unanimously agreed that a European Federation of W.P.S.A. Branches would be the appropriate body to do so. Rules were drawn up and approved for submission to the Council by those members present who had resolved themselves into a Committee to further the project. Eventually the Federation and its Rules were approved by the Council.

The Rules of the Federation are very simple. Its objects are similar to those of our Constitution, with the addition of two sections, one providing for the encouragement of co-operation between its Branches, and the other giving power to institute Regional Conferences whenever necessary and possible, and to assist in the promotion of World's Poultry Congresses. Membership is open to all Branches of the Association in Europe. Contribution by Branches towards expenses is based on the number of members of each Branch. The amount of the contribution will be laid down, from time to time, by the Executive Committee, who are empowered to adjust the contribution rates to meet important changes in exchange rates. Failure to pay the subscription before the end of the year entails forfeiture of membership.

The affairs of the Federation are managed by its Officers, who consist of a President, a Vice-President, and a Secretary-Treasurer, and an Executive Committee composed of one representative from each Branch. No Branch will have more than one representative. These briefly are the rules; but it may be necessary, in light of experience, to alter some of them later on.

Now, may I address my remarks more particularly to the officials of the Branches. It is simply not enough to form a Branch and collect subscriptions. There must be action and service. There are many ways in which Branches can be of service to their members, and to the Association as a whole. Our slogan must be "all for one and one for all", and if we go forward in that spirit there is no limit to what can be done to foster co-operation, goodwill and understanding among poultrykeepers throughout the world.

Finally, I have briefly and, I am afraid, very inadequately sketched the history of our Federation. I ask you to give it your blessing, your utmost co-operation and fullest support.

FIRST EUROPEAN POULTRY CONFERENCE UTRECHT, 15-18 NOVEMBER 1960

The first regional poultry conference in Europe has been a great success. In spite of the fact that a "numerus clausus" for participants could not be avoided, about 450 members of the World's Poultry Science Association from nearly all countries of Europe came to Utrecht. The organisation of the conference was in hands of the Netherland's Branch of the W. P. Sc. A. under the chairmanship of Prof. Dr. C. Romijn, who gave an introduction to the scientific programme after the official opening of the conference by his Excellency, the Minister of Agriculture in the name of the Netherland's Government.

The scientific programme included a number of symposia on different subjects in the whole field of poultry science. In general two specialists, invited by the organizing committee, read a paper on a special subject, followed by a discussion. There was a simultaneous translation into three conference languages, English, French and German. The following subjects have been taken into consideration and were a subject of discussion:

Subject 1. *Egg quality*

Dr. W. Rauch (Germany) Physikalisch-Chemische Messmethoden zur Beurteilung der Eier.

Ir. T. Lohse (Denmark) Handling of eggs with regard to quality.

Discussion leader: *Dr. R. N. Knowles* (United Kingdom).

Subject 2. *Economics*

Prof. Dr. Th. L. M. Thurlings (Netherlands) Concentration of poultry farming in specialized firms as a corollary of economic growth.

O. Bergflodt, I.F.A.P. (Paris) the place of mass production and contract farming in European poultry production.

Discussion leader: *H. H. Garrelds* (Netherlands).

Subject 3. *Broiler production*

R. Péro (France) Poulets de chair, logement.

Ir. N. Reyntens (Belgique) Poulets de chair, alimentation.

Discussion leader: *R. Coles* (United Kingdom).

Subject 4. *Poultry diseases*

Prof. D. K. Fritzsche (Germany)
Dr. R. F. Gordon (United Kingdom)
Prof. B. Ubertini (Italy)
} Control of diseases, associated with broiler production.

Discussion leader: *Prof. Dr. L. de Blieck* (Netherlands).

Subject 5. *Poultry breeding*

Ir. E. F. Geessink (Netherlands) Random sample testing.

M. Menzi (Switzerland) Zusammenarbeit zwischen Züchtern durch mechanische Verarbeitung der Zuchtdaten.

Discussion leader: *Dr. H. Engler,* F.A.O. (Rome).

Subject 6. *Organization*

Major Ian Macdougall O.B.E., W.P.S.A. (London) European Federation of Branches of the Worlds Poultry Science Association.

Discussion leader: *Major Ian Macdougall.*

The complete text of the papers with the discussions will appear in the "Proceedings of the first European Poultry Conference". These "Proceedings" will be sent to the members of the conference, free of charge and will be available to others at the price of about 15 Dutch guilders. Orders should be sent to Mr. F. Thio, International Agriculture Centre, 1, Gen. Foulkesweg, Wageningen, The Netherlands.

All members of the conference got an invitation for the official reception by the Netherlands' Government in the "Rijksmuseum" at Amsterdam and all of them who have been there will remember the stylish environment among the famous paintings of Rembrandt and other masters of colour and light. The burgomaster of the city of Utrecht spoke an address of welcome in three languages to a number of representatives in the Townhall, expressing the feelings of himself and of the Municipal Board of the Conference City. A poultry conference without an exhibition would not have been complete and the organizing committee had the privilege of the coordinating activity of the board of "Ornithophilia". The evening, spent on the exhibition and in the entertainment hall will be unforgettable to the conference members.

On the last day of the conference a number of excursions were made to places of interest for poultry specialists as the Random Sample Testing Station at Putten, the Central Institute for Poultry Research "Het Spelderholt" at Beekbergen, the Laboratory of the Poultry Health Service at Soesterberg, a number of cooperative and private enterprises (breeding farms, egg packing station, etc); and moreover, to some places of touristic interest, such as the Deltaworks, the National Park "Hoge Veluwe", the city of Amsterdam and St. John's Cathedral at 's Hertogenbosch.

At the informal dinner in the evening of the last day, many members had the opportunity to express their feelings of satisfaction. According to the majority of the representatives the conference has been on a high level and a mighty stimulus for the increase in number of W.P.Sc.A. members in Europe.

C. Romijn
(Chairman of the Conference).

PLANNING AND ADMINISTERING AN INDUSTRIAL POULTRY BREEDING PROGRAM IN THE U.S.A.*

JOHN E. KIMBER
Kimber Farms, Inc., Niles, California

The honor of being invited to speak to you tonight is something I shall always deeply appreciate. As the horizons of all of us widen we have an ever-increasing respect for the achievements of others. In the first announcement in 1955 of the Kimber Genetics Award of the National Academy of Sciences it was stated:

> "At the present time there are more than a thousand geneticists in the United States, with many more in other countries. Many of these geneticists have demonstrated most brilliant and profound thinking. They have been intellectual giants of a stature far beyond anything realized by the general public. . . . It is most desirable that . . . these great men be recognized and honored for their contributions to a science which directly affects both mankind's food supply and also the evolution of countless future generations of human beings."

To find myself on the same program with Dr. Sonneborn and Dr. Beadle, named by the National Academy of Sciences to be the 1959 and 1960 recipients, respectively, of the Kimber Genetics Award, and the latter also a Nobel Laureate, makes me feel exceedingly humble, and very limited in my ability to present material of anything but superficial interest to this group. Our complex civilization requires, however, not only basic research of the most profound type, but also the application of science to the work of the world. An adequate food supply is and always will be one of the world's most basic needs.

A FAVORABLE CLIMATE

In order to design, plan, and successfully administer an effective industrial poultry breeding program there must first be a political and economic climate which will permit such a program to flourish. As Dr. Lush so aptly stated to me: "There must be freedom to find the way to the most effective techniques." Fortunately the threat of too much government in

*A talk before the Ninth National Poultry Breeders' Roundtable, Chicago, Illinois, April 30, 1960.

poultry breeding seems to have lessened, at least temporarily, in the United States.

In several other countries, governmental regulations may be holding back the most rapid development of better strains of chickens. The refusal of various countries to permit the importation of superior stocks from other countries which posses them, theoretically justified on the grounds that to do so would introduce certain diseases, is, I believe, unwise. One of the most unfortunate aspects of such import restrictions is that those who place monetary profit above principle and do not hesitate to smuggle in superior stocks, have obtained them, while others who have kept their operations on a high ethical plane have been deprived of the improvement which adding superior stocks to their breeding flocks would have given them.

As for the economic climate, if such fundamental forces as supply and demand are not temporarily interfered with (they *cannot* be permanently disregarded), those who serve our economy efficiently will survive, while inefficient breeders as well as other types of producers will be compelled to become efficient or they will fail to survive. Nature's laws may sometimes seem to be ruthless but we must nevertheless obey them. To those who do obey them they are not unkind.

BALANCE THE BUDGET

No breeding program which bankrupts the enterprise it is supposed to serve, is sound for an organization to carry on, no matter how excellent it may otherwise be.

THE IMPORTANCE OF RESEARCH

It is very difficult for me to visualize a modern industrial poultry breeding program which does not include a certain amount of research. There are many questions to which no one yet knows the answers, but which must be answered before the most effective application of genetic principles can be made. We are today witnessing a race between a number of large progressive poultry breeding enterprises to find the answers to some of the most important questions.

Historically the poultry industry has depended on federal and state experiment stations to conduct research in almost every phase of the industry, not merely research in genetics or breeding. But the time has apparently come when a sizeable poultry breeding establishment must engage in much supplementary research or find itself unable to match the quality and performance of its competitor's products.

How much research may be undertaken must depend on

(1) the size of the business
(2) its financial strength
(3) the nature of its competition
(4) the extent to which the research program adds to the cost of production, and
(5) how much it will improve the quality of its products so that they may be able to command the necessary premium to cover such additional cost of production.

Precision measurements, data processing, genetic analyses and selection, are all costly operations. Yet I have always felt that scholarship and good work are worth their cost if the Biblical admonition: "Moderation in all things," be heeded.

SCOPE OF A MODERN BREEDING AND RESEARCH PROGRAM

Perhaps the manifold activities or projects which ought to be included in a really progressive poultry breeding program should be briefly enumerated and described.

(1) The loss of desirable genes is potentially so serious that a reasonable number of "library stocks" should be maintained. By "library stocks" I mean lines not currently being used to produce commercial chicks, but carrying genes which seem to be too valuable to discard without further testing. A ruthless policy of marketing all germ plasm which is not being used in a current year's selective breeding operations may be very shortsighted. This is one of the costs of an advanced breeding program which the average commercial poultryman knows little about and does not realize that it adds a little to the cost of his chicks.

(2) Control populations are needed to evaluate progress made by different breeding systems or in various populations or lines. This subject would take much more than the entire time at my disposal to present to you, but it has been discussed in great detail by Drs. Goodwin, Dickerson and Lamoreux in "Biometrical Genetics," 1960, pp. 117-138, published by Pergamon Press, New York. Other investigators, particularly Drs. Gowe and King, have emphazised the great importance of control strains.

(3) Perhaps blood typing may have an important place in a breeding program, but who really knows how important this new approach may be or may become ? I doubt if blood typing can possibly take the place of many other operations which must be undertaken, but it may well supplement them.

(4) There are numerous breeding systems being utilized by various breeders and it may not yet be possible to know which is capable of producing the best chickens, or other species of domesticated livestock. At one time so-called "purebreds," in both poultry and dairy breeding, were considered the only respectable lines for a breeder to possess, even though it was pretty well known that breed crosses and even strain crosses gave considerably increased performance in many important traits.

The intricate system of inbreeding and hybridizing followed by corn breeders with such remarkable success gives certain theoretical advantages. However, the fact that this system has been followed by some large breeders for quite a few years and yet chickens produced by other methods are still comparable in quality to anything produced by inbreeding and hybridizing, might indicate that inbreeding and hybridizing may be only one tool or approach to be utilized by organizations with large resources.

Some think that "reciprocal recurrent selection" is what everyone has been looking for, with selection for superior cross performance between strains or breeds. I have been told that some advanced workers have found that in the case of other species, reciprocal recurrent selection has not fulfilled the hopes of many of its advocates. Yet such a system should be included in a really comprehensive breeding program.

(5) Breeding for resistance to various diseases involves some form of more or less controlled exposure and may be indicated in the case of some serious diseases. It may be more practical to control some other diseases by vaccination or immunization, by medication, by sanitation, or by isolation.

Theoretically the control of disease is primarily an environmental problem. Yet the superior resistance of some strains to leucosis, for example, is well known by commercial poultrymen. Poultrymen also know that certain breed crosses possess markedly superior resistance to some respiratory infections as compared with the pure breeds from which they came. A breeder who fails to give some attention to breeding for resistance to various diseases may in the long run be committing economic suicide. A distinguished geneticst once told me that he thinks we ought to have one farm on which every known disease can be thrown at the population, year after year. This is partly a matter of economics and would be another type of cost about which commercial poultrymen do

not think when they consider only price in buying their baby chicks.

(6) The heritability of various traits must be known before the most accurate selection indexes can be worked out and utilized. Some breeders do not consider it necessary or even desirable to compute selection indexes mathematically, but prefer to rely entirely upon personal judgment of overall breeding value, and which individuals, families and lines may best complement each other.

(7) It may be desirable to know the coefficient of inbreeding. The procedures necessary to keep track of such knowledge will undoubtedly appeal to a lot of IBM enthusiasts.

(8) We certainly need to know a great deal more about heterosis.

(9) There are many different criteria of selection for the dozen to twenty or more traits important in present-day poultry breeding operations. The virtual abandonment of the breeding phases of the National Poultry Improvement Plan by breeders themselves, was, I think, the best thing that ever happened to the poultry industry from the standpoint of letting breeders seek and find what ever yardsticks for whatever traits they wish, and how to use them. Perhaps this what Dr. Lush referred to when he said "There must be freedom to find the way to the most effective techniques."

(10) Field trials are among the most important tools of the modern poultry breeder. In no other way can a breeding program assure superior performance on the farms of many different customers.

(11) Studies of environmental influences may well be included in the research carried on by a large poultry breeding enterprise. Just as testing various lines in intensive field trials may reveal otherwise unknown responses or behavior, so also testing one's products under still more variable and extreme conditions may be the only way in which the full potential of one's genetic resources may be realized.

(12) Such economic considerations as the efficiency with which various measurements are made or other work carried on, can greatly affect the cost of production and consequently the ability to survive. In private industry, meeting production schedules on time, and meeting deadlines in making up matings, is very important, as every day lost costs thousands of dollars. The team of geneticists and their aides must plan their work well in advance so that all phases of the breeding

program are scheduled, and time is allowed for unexpected obstacles in attaining their schedules.

In planning the overall operation, some time must be allowed for inevitable delays because in any program as complicated as poultry breeding certain jobs may require more time than anticipated. Summarizing results may also require additional time and new ideas may be developed at the time of this work which should not be passed up. Occasionally data processing machinery does not behave as it should.

RATES OF PAY

The scale of compensation of various workers may be more a matter for management than a matter of inheritance, but must be considered in the organization of the breeding and research program. It is difficult for an enterprise paying $1.95 or more per hour to rank and file workers, to compete with an enterprise paying only 65¢ per hour, or only one-third as much. The cost of labor is rapidly becoming one of the largest if not the largest single item of expense in the budget.

IMPORTANCE OF BUDGETING

The best way of protecting a breeding and research program from the inevitable fluctuations in production, sales, and profits which are inherent in industry, is to provide for such a program in a carefully prepared budget. This is not easy to do. A layman's judgment may be different from the judgment of his scientists. Every effort should be made to know true costs.

Once the budget is adopted it should be followed closely. It may have to be revised from time to time but every effort should be made to avoid running over the budget to any great degree.

Possibly the carrying of excess inventories is the easiest way to overshoot the budget. Another good way is to make the breeding program more complicated than is absolutely necessary. Every time pens of birds have to be resorted for whatever reason, costs go up like the ticking away of a taxicab meter.

Yet if it is found that a mistake has been made, or that males from a certain line should be used but have not been, there should be no hesitancy in rectifying the situation, for the most costly error of all is to fail to achieve maximum results.

THE CHANGING NATURE OF COMPETITION

In past years competition from multipliers was of prime importance to breeders. They would buy pure strains from breeders, mate them and sell stock that would be fairly comparable to that which the breeder was attempting to sell at a somewhat greater production cost. Today we find a great change in this phase of the industry with the change of breeding systems and techniques and the widespread use of breed and strain crosses and hybrids. The multiplier can no longer buy pure strains and produce chicks so nearly comparable to the breeder's . Many multipliers—as well as some former breeders of note—have become associated with large breeders and in doing so they purchase parent stock from their breeder and sell his trademarked product. With this change in the industry the breeder now has the *assistance* of his multipliers who have become business associates and actually help to finance the breeder's ever-enlarging program through royalties which, though much less than would sustain even a small breeding program by a single associate under most conditions, nevertheless count up when great volume is achieved through national and even international franchise networks, and make it possible for the large breeder to spend *millions of dollars per year* on further improvement in his products, something that small breeders and even state experiment stations can not do.

RESEARCH SHOULD NOT BE LIMITED TO CURRENT PRODUCTS

No matter how promising one's best present products may seem to be, it is very important to test new combinations and new germ plasm in the unending search for something still better. Dipping back into the library stocks, the testing of competitor's products and the careful analysis of their genetic constitution to whatever extent possible, are collateral projects that should be provided for if one it to remain competitive.

We have better chickens today for commerical poultrymen than anything in existence only twenty years ago. That much more will be achieved in the next twenty years is, I believe, a certainty. If we project future advances as much as a hundred and twenty years, we should find types of chickens in both egg and meat categories that will be as far superior to our best present birds as those we now have are superior to the fowl running around the farms in many lands. I have

been particularly impressed to see how much more productive and efficient producers of food our best American chickens are than those stocking the farms of several European countries. I do not know how the poultry found in Asia compares but imagine there is great room for improvement there also.

The twentieth century has already become the most astonishing period in the history of mankind, and it still has forty more years of unfolding miracles and unexpected surprises. We who are engaged in the undramatic but basic work of food production may never capture the imagination of the masses as have many other fields of achievement, but we should nevertheless apply ourselves to accomplish as much as we can in our chosen field which certainly possesses in substance whatever it may lack in glamor.

POULTRY PRODUCTION IN PAKISTAN

LEE W. HERRICK
I.C.A. Poultry Advisor to the Government of Pakistan 1955-1960

Pakistan is a large country in the Asian sub-continent with 84,000,000 people and an area of 365,637 square miles. East Pakistan is riverine, West Pakistan arid, and the two provinces are 1,000 miles apart with India between.

Pakistanis love to eat chicken. Yet they produce only an average of 0.5 pounds per person per year, and 4.3 small eggs per person per year. With two meatless days each week there is a great need to increase poultry to provide protein food for better health.

Pakistan has two provinces and the Governments of East and West Pakistan are both responsible to the Central Government. Each Government has an officer in charge of its poultry program. There are 26 Government Poultry Farms located in different areas. The Pakistan Animal Husbandry Research Institute Poultry Experiment Station, Landhi, a Central Government farm, is situated on a 25 acre tract 15 miles from the heart of Karachi. Its housing capacity increased from 500 layers in 1955 to 3,500 in 1960, with adequate buildings to brood, rear, service this flock and produce hatching eggs and chicks for sale to private breeders. It has good facilities, as buildings, water supply, and equipment. The Farm Manager received a year's practical poultry training in Australia and demonstrates good management and poultry "know-how" under the guidance of the capable Officer-in-Charge.

Fig. 1. Dr. Mohammed Yaqoob, Poultry Resarch Officer, West Pakistan, villager, and Lee Herrick, I.C.A. Poultry Advisor looking at chicks from local hens and purebred cockerels.

Fig. 2. A mud nest covered by a basket serves for the broody hen in a village.

Fig. 3. Cooperative Poultry Farm sponsored by Village AID. Started in 1958 with 100 layers, it is planned to expand to 2,000 layers.

Fig. 4. Cooperative Poultry Farm sponsored by Village AID. Started in 1958 with 100 layers, it is planned to expand to 2,000 layers. Laying houses are quite inexpensive and practical.

Fig. 5. Cooperative Poultry Farm sponsored by Villiage AID. Started in 1958 with 100 layers, it is planned to expand to 2,000 layers. A kerosene lantern is used in a box for brooding.

Fig. 6. A small new private poultry farm along a main highway.

East Pakistan's 7 farms have a combined laying stock of approximately 4,000 layers. Five new farms starting in 1959-1960 are on larger and better sites, with modern 40 X 50′ poultry houses, and are expected to increase service to people in their areas.

West Pakistan's 8 farms have approximately 4,000 layers, and 5 new farms were started in late 1959. The Quetta farm had 350 layers in 1955, and 850 in 1959; the Lahore farm had 550 layers in 1955, 776 in 1958, and 1,900 in December 1959.

Government Poultry Farms are distributed over the Provinces to serve their area by supporting the small beginning poultry industry of Pakistan. They serve as demonstration farms, where the best breeding, feeding, management, housing, and disease control methods can be observed. Poultrymen can also obtain training at these farms, and the Central Government Farm has conducted 6 week practical poultry courses and trained 156 students since 1958. Military services in Pakistan encourage and assist retiring personnel to take vocational training in their field of interest, and quite a few have taken poultry. Other students have included government employees in Animal Husbandry, Agricultural Extension, and Village AID, and private poultry keepers. There have also been 136 men trained at the Quetta farm since 1955.

Government farms serve as a base for production and distribution of improved breeding stock, as shown in Table 1.

TABLE 1

Distribution of Improved Breeding Stock, 1957-1959 inclusive.

From	Hatching Eggs	Day Old Chicks, growing, and Mature Stock
Central Government (1 farm)	186,213	53,004
East Pakistan*	109,995	29,069
West Pakistan**	43,338	40,370
TOTAL	339,546	122,433

* 7 farms in operation until middle of 1959. 5 farms started in 1959-60.

** 2 farms only (Quetta and Lahore). 6 other smaller farms operating, but information not obtained. 5 farms started in late 1959.

Improved breeding stock has been imported to these farms during the past 10 years, mostly in the form of hatching eggs. The greatest percentages of imports have been White Leghorn and Rhode Island Reds, with other breeds including Light Sussex, Black Minorca, Australorp, Barred Plymouth Rock,

White Plymouth Rock, New Hampshire, and Nagoya. The White Leghorns and Rhode Island Reds seem most popular as egg producers. Imports have come from U.S.A., Canada, United Kingdom, Australia, Holland, and Japan. In 1959 sexed day old chicks, White Leghorn and Rhode Island Red, were imported from Record of Performance breeders in U.S.A. to furnish a new nucleus of breeding stock.

Research in poultry nutrition has been conducted since 1955 at the farm in Lahore, in cooperation with the Animal Husbandry College. The Central Government's farm at Landhi has conducted research in disease control, management, nutrition, house type and heat conrtol, starting in 1957. A senior Poultry Development Officer in the Central Government conducts educational and disease control work in the Karachi Federal Area, annually vaccinating about 60,000 chickens against Ranikhet Diseases and Fowl Pox, and providing advice for approximately 500 poultry kesepers through home visits.

Quite a few men have received some advanced poultry training overseas. Before partition, in 1947, the Indian Government sent three men to U.S.A. and one to U.K. for

Fig. 7. The Poultry Experiment Station at Landhi has modern electric incubators with 26,500 egg capacity to supply its own needs and sell day old chicks to poultry keepers.

Fig. 8. The Poultry Experiment Station at Landhi uses sawdust litter, kerosene and electric brooder stoves.

graduate training, who opted for Pakistan at partition. Since 1951 ten men have received poultry training in U.S.A. and one in Australia.

The most common disease problems in West Pakistan are Ranikhet, Spirochetosis, and Fowl Pox, and in East Pakistan Ranikhet, Coccidiosis, and Fowl Pox. Considerable research on methods of transmission, control, and vaccination for Ranikhet, Fowl Pox, and Spirochetosis has been conducted at the Pakistan Animal Husbandry Research Institute, Peshawar, since 1949, and on Ranikhet at the Civil Veterinary Hospital, Quetta, since 1955.

Educational work in improved poultry practices has been conducted in villages by Animal Husbandry and Village AID, and recently by Agricultural Extension. Often distribution of improved breeding stock from Government farms, in the form of eggs, chicks, or 8 week old cockerels, has gone hand in hand with the educational work. Vaccination against Ranikhet and Fowl Pox, which is done at no cost to the villager, is conducted at the request of villagers. To answer the many requests for information on improved poultry practices the Central Government published a poultry management bulletin in 1960.

Fig. 9. At the Poultry Experiment Station, Landhi, each chick is vaccinated against Ranikhet and Fowl Pox when seven or eight weeks old.

Fig. 10. Modern laying house management at the Poultry Experiment Station, Landhi. Mr. Qutubuddin, Farm Manager, is marking the record.

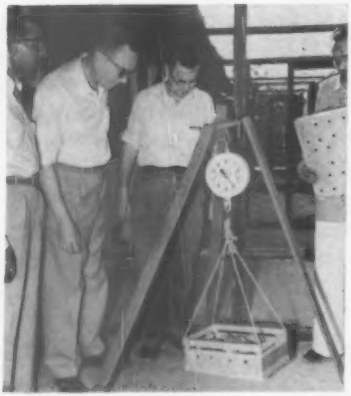

Fig. 11. Sanitary disposal of dead chickens in a disposal pit at the Poultry Experiment Station, Landhi.

Fig. 12. Weighing chicks in Nutrition Experiment at Poultry Experiment Station, Landhi. *Left to Right:* Mr. Malik Fazl Hosain, Officer-in-charge of Farms; Dr. Burch Schneider, Animal Nutritionist, Washington State University, Inter-College Exchange; Mr. L. W. Herrick, I.C.A. Poultry Advisor; Mr. M. Hussain, in charge of experimental chicks.

Fig. 13. Cooking and drying meat offal for Nutrition Experiment at the Poultry Experiment Station, Landhi.

In January 1960 Lever Brothers, a U.K. firm operating in Pakistan, manufactured the first balanced poultry feed in Pakistan. This will greatly reduce the feeding problem of Government poultry farms and private poultry keepers. Prior to that time a poultry keeper desiring to provide a balanced feed was required to go to the bazar, purchase many ingredients at retail price, process certain ingredients as slaughter house offal and blood, and mix the ingredients. He also had to purchase lucerne or other greens daily. This system was not only troublesome but costly as well.

Many villagers have two to five desi (local) birds which produce 40 or 50 small (16 oz. per dozen or less) eggs per year. Scavenging and use of table scraps are the common methods of feeding as no commercial balanced poultry feed has been available. There are some large flocks and interest in commercial flocks has increased as shown in Table 2.

TABLE 2

Expansion of Private Poultry Production in Karachi and Quetta Areas* showing number of breeders with flock size.

	LAYERS					
Year	*25*	*50*	*100*	*200*	*500*	*1,000*
			Quetta Area			
1956			All below 25 layers			
1957	12	3	—	1	—	—
1959	150	40	—	—	—	—
			Karachi Area			
1950	100	5	5	1	—	—
1955	300	40	15	1	2	1
1959	550	60	22	2	2	1

* Private flocks are also expanding in other areas.

Many villagers still keep their few birds, but cross their local hens with improved cockerels and find that the offspring are larger, lay more eggs, larger eggs, and they receive a larger price per egg and per bird, so they are well pleased with them. Several cooperative poultry farms have started in the Hyderabad region, about 150 miles from Karachi, with several hundred layers and these plan to expand to 2,000 layers each.

There are four annual poultry shows in Pakistan with 400 to 1,400 entries each, and quite a few smaller local shows. During the past few years the public has become increasingly interested in poultry production, not only in raising chickens but also in making poultry equipment, publishing magazines and books, producing ingredients for poultry feed, operating hatcheries, and other allied industries. Poultry in Pakistan

has developed to a point at which feed, breeding stock and information are now available, private interest is high, and hence progress should be much more rapid in the next few years. Starting a feed industry was one big step, and poultry development will gather speed as there are more facilities, "know-how", interest and enthusiasm to build on. Poultry production in Pakistan has a bright future.

Fig. 14. Receiving R.I.R. and W.L. day old chicks from Record of Performance Breeders in U.S.A. for foundation breeding stock at the Poultry Experiment Station, Landhi.

REVIEW OF POULTRY PUBLICATIONS

(Abstracts from Animal Breeding Abstracts and from *Nutrition Abstracts and Reviews* are reproduced by arrangement with the Commonwealth Agricultural Bureau, Farnham Royal, Bucks, England.

Acknowlegment is also made to Biological Abstracts, University of Pennsylvania, Philadelphia 4, Pennsylvania, U.S.A. for the Abstracts taken from *Biological Abstracts.)*

GENETICS

AMADON, D. 1959. [Dep. Birds, Amer. Mus. Nat. Hist., New York.]
THE SIGNIFICANCE OF SEXUAL DIFFERENCES IN SIZE AMONG BIRDS. *Proc. Amer. phil. Soc.*, 103: 531-536.—In general, sexual size dimorphism is believed to be based on natural selection for increased size resulting from competiton for mates, usually by ♂♂. The dimorphism is greater in species that are polygamous and promiscuous than in the monogamous species. In some of the species in which the ♀ is larger than the ♂, the ♀ apparently plays the dominant role in courtship. In others, the reversed size dimorphism appears to be associated with the predatory habits of the species. (Animal Breeding Abstracts)

BECKER, W. A., and **L. R. BERG.** 1959. [Western Washington Exp. Sta., Puyallup.]
HOMEOSTASIS AND THE SENSITIVITY OF EXPERIMENTS USING CHICKENS. *Poult. Sci.*, 38: 362-372.—Following up earlier observations that heterozygous individuals are more resistant to environmental stresses and consequently their populations are less subjected to phenotypic variance than are homozygous individuals and populations, variance in body weight was studied in 4 genotypes of fowl. For bio-assay and other quantitative studies, reduced variance renders heterozygous progeny preferable to homozygous parents. In the present work, high- and low-plane diets were given to apparently homozygous and heterozygous pullets in either single- or mixed-sex pens. Separated ♂♂ proved to be more sensitive to dietary differences than separated ♀♀ or mixed individuals. Furthermore, the sensitivity rose and fell, culminating at 2 wks. of age in homozygous White Rock and White Leghorn ♂♂, but at 5 wks. in White Rock×"Synthetic White" crosses. At 7 wks. sensitivity of the crosses was higher than that of the other strains used. As to differences in body weight between these strains, they were greater on high-plane than on low-plane diets. Finally, the coefficient of variation was larger on the low-plane diet. (Animal Breeding Abstracts)

BEBAK, B. 1959. [Dep. Exp. Evol. Anim. Genet., Jagiellonian Univ., Cracow.]
THE HISTOLOGICAL BACKGROUND OF FERTILITY IN AN INTERGENERIC CROSS. *Bull. Acad. polon. Sci., Ser. Sci. biol.*, 7: 371-375.—Between the autumn of 1955 and the spring of 1958, 41 hybrids (22 ♂♂, 19 ♀♀) between the Muscovy *(Cairina moschata)* and the Pekin *(Anas platyrhynchos)* duck were obtained at Gaik Brzezowa Experiment Station. Externally, the testes of ♂ hybrids (irrespective of the direction of the cross) differed little from those of the parental species, but histological examination revealed that spermatogenesis did not proceed beyond the primary spermatocyte stage. Sexual activity was observed in the ♂ hybrids, but no progeny were obtained, even

after testosterone injection. The characteristics of the ♀ hybrids differed with the direction of the cross. Female hybirds with a Muscovy dam laid non-fertile eggs averaging 41 g. in weight *v* 81 g. for Pekin and 75 g. for Muscovy ducks. The hybrid eggs were similar to Muscovy eggs in colour. Female hybrids with a Pekin dam possessed no gonads, except for a vestigial oviduct. In many external features the hybrids were intermediate between the Muscovy and the Pekin duck. In plumage colour, however, they resembled the Muscovy. The bill was pink, as in the Muscovy; but hybrid ♂♂ did not possess the red excrescence characteristic of the bill of Muscovy ♂♂. In hybrids of both sexes body weight at 2 yrs. of age was less than in birds of either parental species. In incubation duration the hybrids were intermediate between the Pekin and the Muscovy duck. (Animal Breeding Abstracts)

BENOIT, J., P. LEROY, C. VENDRELY, and **R. VENDRELY.** 1958. Phenotype du bec des canetons de premiere et deuxieme generations provenant de canards Pekin anterieurement traites a l'acide desoxyribonucleique de canard Khaki Campbell.

[PHENOTYPE OF THE BILL OF FIRST AND SECOND GENERATION DUCKLINGS PRODUCED BY PEKIN DUCKS PREVIOUSLY TREATED WITH DESOXYRIBONUCLEIC ACID FROM KHAKI CAMPBELL DUCKS.] *C. R. Acad. Sci.* [*Paris*], 247: 1049-1052.—In 1956 Pekin ducks injected at 8 days of age with DNA from Khaki Campbells were found to have unpigmented pink bills. In 1957 these ducks mated *inter se* produced 23 ducklings of which 5 had pink bills. In 1958, without any further DNA injections, the same ducks were again mated *inter se* and produced ducklings of which 21 had pink bills, 31 pink-yellow, and 36 yellow; matings between one pink-billed and one untreated control duck produced 1 pink-billed, 19 pink-yellow and 72 yellow-billed progeny. When mater *inter se* 1st generation progeny produced 4 pink-billed, 38 pink-yellow billed and 61 yellow-billed duckings. One of the pink-billed ducklings was produced by 2 yellow-billed 1st generation parents. The other 3 pink-billed ducklings were sired by a pink-billed F_1 drake, which, when mated to a control yelow-billed ♀, sired a further 7 pink-billed ducklings. The 291 progeny of untreated controls all had yellow bills. (Animal Breeding Abstracts)

BENOIT, J., P. LEROY, C. VENDRELY, and **R. VENDRELY.** 1959. Etat actuel de la coloration du bec chez les canards Pekin traites en 1956 a l'acide desoxyribonucleique de canard Khaki Campbell et chez leurs descendants.

[THE COLOURATION AT PRESENT OF THE BILL OF PEKIN DUCKS TREATED IN 1956 WITH DESOXYRIBONUCLEIC ACID FROM KHAKI CAMPBELL DUCKS AND OF THE DESCENDANTS OF THE FORMER.] *C. R. Acad. Sci.* [*Paris*], 248: 2519-2521.—The bills of the progeny produced by parents treated with DNA that were pink-yellow on hatching, were yellow when the ducks were adult. One of the F_1 and one of the F_2 ducklings which had apparently pink bills on hatching had yellow bills when adult. Some of the injected ♀♀, and of the F_1 and F_2 ♀♀ which had yellow or pink bills on hatching began to develop black spots on the bill at about 10 mths. of age; the black became more noticeable later. The black markings differed from those frequently observed on Pekin ducks. (Animal Breeding Abstracts)

BERRY, J. E., and **J. V. CRAIG.** 1959. [Kansas State Coll., Manhattan.]

ESTIMATION OF GENETIC DIVERSITY AMONG STRAINS AND BREEDS OF CHICKENS BY LYMPHOCYTE INCREASES FOLLOWING SKIN GRAFTING. *Poult. Sci.* 38: 439-442.—Skin grafts were exchanged within and between strains of White Leghorns and Rhode Island Reds and between breeds with a view to determining lymphocyte percentages, pre- and post-operative. From pre-operative counting, strains of the same breed did not differ significantly in this

trait, but W.L.s had significantly higher percentages than R.I.R.s. The intensity of immune reaction, as measured by post-operative increases in lymphocyte percentages, significantly depended on pre-operative percentages. Skin grafting between different breeds and strains did not result in significantly higher percentage increases than grafting within the same strain. Thus, this method is not suitable for estimating genetic diversity between breeds and strains of fowls. (Animal Breeding Abstracts)

BRILES, C. O., W. H. McGIBBON, and M. R. IRWIN. 1959. (Univ. Wisconsin, Madison.]
ADDITIONAL ALLELES AFFECTING RED BLOOD CELL ANTIGENS IN THE CHICKEN. *Genetics*, 44: 955-965.—The serological and genetic relationships of red blood cell antigens produced by genes at the *A*, *B*, *D* and *E* loci of the fowl are described. Additional alleles have been demonstrated at the *A* and *E* loci. The results of test matings are compatible with the concept of close linkage between these 2 loci. (Animal Breeding Abstracts)

COCK, A. G. 1959. [Agric. Res. Coun. Poult. Res. Centre, Edinburgh.]
IRREGULAR MOSAICISM IN A HEN. *J. Hered.*, 50: 171-176.—A mosaic F_1 ♀ from a cross of two highly inbred lines (Rhode Island Red × White Leghorn) is described. Parts of the plumage have the pigmentation pattern of the R.I.R. breed; the remainder has the normal F_1 phenotype (white with occasional blue-grey ticks). In a progeny test the mosaic bred as a normal F_1. The melanocytes of the R.I.R.-patterned parts of tht plumage must lack at least 3 genes *(I, E* and *Bl)* derived from the White Leghorn. Somatic mutation or chromosome aberration is therefore an unlikely origin, and it is suggested that the aberrant patches arose by incorporation into the embryo of cells derived from one or more supernumerary spermatozoa. The distribution of R.I.R.-patterned patches in the plumage is quite irregular and highly discontinuous; the number of individually mosaic feathers is very large. These individually mosaic feathers, which in some regions comprise as much as 90% of all feathers, conform to one basic arrangement, with a central R.I.R.-patterned stripe and white lateral edges. The reciprocal arrangement (white centre and R.I.R. edges) never occurs.—From author's summary. (Animal Breeding Abstracts)

DE BEER, J. A. 1959. [Coll. Agric., Glen, O.F.S.]
RESULTS OF CENTRAL EGG-LAYING TEST—1958-59. *Fmg S. Afr.*, 35: (7): 38-39.—In the 5th progeny test there were 360 entries in the cock-and-hen progeny trapnest test and 820 in the cock progeny single pen test. In the former Black Australorps had the highest production with an average of 202.5 eggs per bird, and in the latter New Hampshires were best with 198.4. In both tests the best individual bird was a Black Australorp, that in the cock progeny single pen test laying 314 Grade A eggs. The over-all mortality rate was 11.0, 0.2% lower than in 1957-58. (Animal Breeding Abstracts)

DERANIYAGIA, P. E. P. 1958. [Dep. Nat. Mus., Colombo, Ceylon.]
HYBRIDIZATION AND SOME ASPECTS OF BEHAVIOR IN THE CEYLON JUNGLE FOWL GALLUS LAFAYETTI. *Spolia zeylan.*, 28: 175-179.—A description is given of 1 ♂ and 3 ♀ offspring of a purebred jungle cock and a hybrid (♂ jungle fowl × ♀ English Game bantam) hen. The ♂ tended to resemble the jungle fowl in colour and in comb shape, but the spurs were less developed. One of the ♀♀ (and another that died) resembled a jungle hen in colour, while the other 2 resembled their hybrid dam. Each laid only 2 eggs (in a clutch), compared with the 6 or 7 laid by their dam. Some of the ways in which the behaviour of pure and hybrid jungle fowl differs from that of the domestic fowl are indicated. The body and skeletal measurements of individual jungle cocks are tabulated, together with comparable skeletal measurements for a Leghorn and a Rhode Island Red cock. (Animal Breeding Abstracts)

DOBRYNINA, A. Ja. 1958. Reciproknye skrescivanija moskovskih kur i leggornov.

RECIPROCAL CROSSING WITH MOSCOW AND LEGHORN FOWLS. *Trud. Inst. Genet. (Mosk.)*, No. 24,: 307-320.—At Bratcevskii Poultry Farm the experiment was started in 1954. Leghorn ♂ × Moscow breed group hens produced progeny in which mortality was lower, growth and development better, and egg production higher than in either parent breed; they fattened more easily and yielded better quality meat than did the Leghorns. When Moscow ♂♂ were crossed with Leghorn ♀♀ the progeny did not mature as early, egg production was not so high and meat quality was not as good as in the reciprocal cross; mortality was lower and meat quality better, although egg production was less than in purebred Leghorns. (Animal Breeding Abstracts)

DUBOVSKII, N. V. 1959. Mezlineinaja gibridizacija kur.

[INTERLINE HYBRIDISATION OF FOWLS.]*Zivotnovodstvo*, 21 (9): 69-74.—The crossing of inbred lines for production is considered. At a collective farm in Stalin Province comparative tests were carried out with two 4-line crossbreds and purebred New Hampshires imported from U.S.A., and with local Russian Whites. Egg production was higher and mortality and food consumption were lower in the line crosses than in the pure breeds. (Animal Breeding Abstracts)

DUBOVSKII, N. V., and R. K. EVTISCENKO. 1959. Rost i mjasnaja produktivnostj cypljat pomesei mjaso-jaicnyh porod.

GROWTH AND MEAT PRODUCTION OF CROSSBRED CHICKS OF MEAT-EGG BREEDS. *Pticevodstvo*, 9(9): 13-17.—Reference is made to work in the U.S.A. At the Ukrainian Poultry Breeding Experimental Station crosses were made with White Plymouth Rocks, Barred Plymouth Rocks, Rhode Island Reds, New Hampshires, White Wyandottes, Pervomais and 2 varieties of Poltavians. The crossbreds were fattened to 75 and to 90 days of age and carcass characters were compared with those of New Hampshire× Russian White crossbreds. Data are tabulated. It is concluded that the best results were obtained with the Barred Plymouth Rock×New Hampshire cross, and that crossing 2 meat-egg breeds produced better broilers than crossing a meat-egg with an egg breed. (Animal Breeding Abstracts)

DUBOVSKII, N. V., and M. G. KURDSUKOV 1960. Ulucsenie krupnyh seryh gusei putem othora proizvoditelei po plodovitosti.

IMPROVEMENT OF THE LARGE GREY GOOSE BY SELECTION OF GANDERS FOR FERTILITY. *Pticevodstvo*, 10 (2): 29-32.—The Large Grey breed was recognised by the Ministry of Agriculture of the U.S.S.R. in 1956. It was developed at the Arzenka Poultry Breeding Experimental Station in Tambov Province from Romny and Toulouse geese; the breed is characterised by grey plumage on the neck, back and breast with white on the underparts, absence of wattles and large size; it has good meat characters and makes good use of pasture. At the Ukrainian Poultry Breeding Research Institute body weight averaged 6.8 kg. for ♂♂ and 6.3 kg. for ♀♀; in 1957 the♀♀ averaged 40.6 eggs, from which 10.9 day-old goslings were hatched. In an attempt to increase hatchability in 1957 twenty groups each of 1 ♂ and 3 ♀♀ were selected on exterior and ♀ fertility; hatchability percentage was not increased. In 1958 four of the ganders in groups in which hatchability was good in 1957 (66.8%) were selected and the hatchability in the groups in which they were placed averaged 68.6%. Fifteen sons of 10 of the best ganders in 1957 (hatchability 60.4%) were placed in groups of which subsequent hatchability in 1958 averaged 65.5%. These two groups averaged 66.2% hatchability, which was significantly greater than the flock average for 1957 (47.2%). The son of a gander with a hatchability of 38.1% in 1957 himself gave low hatchability (38.7%) in 1958. (Animal Breeding Abstracts)

FODOR, I. 1959. Pticevodstvo Rumynskoi Narodnoi Respubliski

POULTRY BREEDING IN THE ROMANIAN PEOPLE'S REPUBLIC. *Pticevodstov*, 9 (12): 38-39.—In 1948 there were 14,85,000 adult poultry in Romania. In 1949 a total of 207,000 Leghorn and Rhode Island Red day-old chicks and Khaki Campbell and Pekin ducks were introduced, management and nutrition were improved and 100 hatcheries and 9 breeding centres were started. In 1959 there were over 59 million poultry. The level of nutrition was still too low. It is hoped to increase av. egg production to 100 eggs, and that at state farms to 140. (Animal Breeding Abstracts)

GINTOVT, V. E. Biologiceskie osobennosti i hozjajstvenno poleznye kacestva pomesnyh cypljat.

BIOLOGICAL CHARACTERISTICS AND ECONOMICALLY ADVANTAGEOUS QUALITIES OF CROSSBRED CHICKENS. *Pticevodstvo*, 1959, No. 9, 36-37.—Groups of purebred Russian White, Rhode Island and Rhode Island × Russian White chicks were reared in similar conditions on standard rations. In a trial from 9 to 21 days of age, the crosses had higher weight gains and feed efficiency than the pure breeds. From 38 to 51 days of age the crosses had better weight gains than both the pure breeds and better feed utilisation than the Russian Whites. There was no significant difference between the groups in digestibility of nutrients.

The crosses had relatively shorter intestines, but the walls were thicker, mainly because of thickening of the mucous membranes. The crosses were characterised also by thicker mucosa of the stomach. The shortening of the digestive tract is compensated by better development of the organs of secretion and absorption; volume relative to liveweight is on the whole smaller and therefore intake of nutrients per kg. liveweight is smaller, but the crosses are better able to utilise the nutrients. —R. G. Hankin (Nutrition Abstracts & Reviews)

GLEICHAUF, R. 1958. (BundesforschAnst. Kleintierz., Celle.) Die Bedeutung der Hybriden fur die Zucht und Mast von Geflugel.

THE IMPORTANCE OF HYBRIDS IN POULTRY BREEDING AND FATTENING. *Dtsch. WirtschGeflugelz.*, 10: 219-220: 236-238.—(Animal Breeding Abstracts)

GROMOV, A. M., and **P. I. FEOKTISTOV** 1958. Izmenenie nasledstvennosti u kur posredstvom perelivanija krovi.

CHANGES IN THE INHERITED CHARACTERS OF HENS BY BLOOD TRANSFUSION. *Trud. vsesojuz. nauc.-issled Inst. Pticev.*, 25: 133-143.—This is not appreciably different from another report on the same work. (*See A.B.A.*, 24, No. 1911.) (Animal Breeding Abstracts)

GROSMAN, P., and **E. OZOLA** 1960. Vlijanie mezporodnogo skrescivanija gusei na uvelicenie ih miasnoi produktivnosti.

THE EFFECT OF THE CROSSBREEDING OF GEESE ON INCREASING THEIR MEAT PRODUCTION. *Pticevodstvo*, 10 (1): 33-34.—In Latvia, Chinese geese have an av. body weight of 4667 g. and an av. production of 49 eggs. Toulouse and indigenous geese average 6357 and 8220 g. body weight resp. and 26 and 24 eggs. In a preliminary experiment, reciprocal crosses between Chinese and Toulouse geese, and between Chinese and indigenous geese had an av. body weight equal to that of the meat breeds and egg production greater than that of the Chinese geese. (Animal Breeding Abstracts)

HALE, R. W. 1959. [Queen's Univ., Belfast.]

HERITABILITY OF LAYING-HOUSE VIABILITY IN A WHITE WYANDOTTE FLOCK. *Poultry Sci.*, 38: 471-474.—A White Wyandotte flock, from a stock apparently free of leucosis, was protected from infection as much as possible. Over a number of years the flock showed high mortality, with a particularly high percentage of deaths from leucosis. The records of the Wyandottes, which appeared to be particularly susceptible to the disease, were tested for inherited

viability and resistance to leucosis for 2 yrs., when death rates were very high. Heritability estimates were 0.098 for all causes of death and 0.036 for deaths from leucosis. Maternal influence may cause the high incidence of leucosis by non-additive genetic effects or transmission of the virus to eggs. (Animal Breeding Abstracts)

HAYS, F. A. [? 1957.] [Massachusetts Agric. Exp. Sta., Amherst.]
BREEDING FOR HIGH EGG PRODUCTION. SECT. I. SELECTIVE BREEDING FOR HIGH AND LOW HATCHABILITY. SECT. II. THE BROODY INSTINCT IN RHODE ISLAND REDS. SECT. III. BREEDING FOR EGG PRODUCTION TRAITS. *Bull. Mass. agric. Exp. Sta.*, No. 504: 56 pp. (B.)—This is a final report on 3 long-term projects, various aspects of which have been described from time to time, and abstracted in *Animal Breeding Abstracts.*

Sect. I. Following a preliminary test for hatchability, an attempt was made to develop 2 lines, one for high and one for low hatchability, through 12 generations of selective breeding. R.I.R. stock that had been bred for high fecundity for many years was used and selection of breeders was confined within the lines. Close inbreeding occurred because few birds were used as a foundation and because later breeding operations were restricted to 2 breeding pens in each line. Efforts to develop 2 lines that differed consistently were only partially successful. However, the experiment produced some important information and demonstrated that hatchability does respond to selection even though heritability is low.

Sect. II. Results of selective breeding over a 20-yr. period to eliminate the broody instinct in R.I.R.s are reported. The 1st generation had an incidence of 23.8% broody and in the 13th generation the instinct was completely eliminated. Selective breeding alone reduced the incidence of broodiness to about 3% in this experiment but proved entirely ineffective for completely eliminating it. However, by limiting the selection of breeders in 1948 and 1949 to individuals that reacted only slightly to prolactin injections (50 I.U.) the broody instinct was entirely eliminated. The daughters of hens thus selected proved to be entirely free of broodiness in their 1st laying year. Random selection within the line was carried out from 1950, since when no broody hens have been obtained in 6 generations. There is some evidence, however, that complete elimination of broodiness in R.I.R.s may reduce annual egg production.

Sect. III. A summary of results in breeding R.I.R.s for high fecundity is presented for the past 23 yrs. to emphasise the important changes in production traits that have occurred under open-flock breeding followed by closed-flock breeding.

Genetic equilibrium appeared 2 generations before the flock was closed, giving a peak level in egg production at 233 eggs. This level of egg producton has not been satisfactorily overcome by rigid selection, probably due in part to increased inbreeding. The estimated degree of inbreeding was about 12% when genetic equilibrium appeared. At the close of the experiment the degree of inbreeding approached 30%. Inbreeding increased adult mortality. The maximum level of egg production of survivors was 240 eggs attained in 1951. Since then there has been a decline in egg production very likely associated with increased inbreeding. If each per cent increase in the degree of inbreeding reduces egg production by 1 egg, the flock at present should average around 270 eggs.

Experimental strain crosses with several strains have raised the production level to about 275 eggs in recent years. In selection of outside strains to cross with a closed flock both superior egg production and very high viability are first essentials. For purposes of maintaining pure breeds for maximum egg production, strain crosses are strongly recommended.—From author's summaries.

HENDERSON, E. W. 1959. [Dep. Poult. Sci., Michigan State Univ., East Lansing.]
SEX IDENTIFICATION BY DOWN COLOR OF SILVER LACED AND "RED LACED SILVER" CHICKS. *Poult. Sci.*, 38: 599-602.—Evi-

dence is recorded of the relative colour distinction between sexes of day-old chicks of 2 synthetic Silver meat-type varieties, Silver Laced and "Red Laced Silver". "Autosexability" of Silver Laced Cornish when mated *inter se* was 76%, and that of progeny of Red Laced Silver ♀♀ × "Gold" ♂♂ was 73%. (Animal Breeding Abstracts)

HILGERT, I., and **M. VOJTISKOVA** 1959. (Inst. Biol., Czechoslovak Acad. Sci., Prague.]

SPECIES HAEMOGLOBIN IN GUINEA FOWL HEN-DOMESTIC COCK HYBRIDS. *Folia biol. (Praha)*, 5: 317-321. (Russian summary.)—A comparative study was made of the resistance to alkali denaturation of haemoglobins obtained from the blood of White Leghorn fowls, Virginia turkeys, Pekin ducks, domestic geese, guinea-fowls, and guinea-hens × domestic cock hybrids. Species differences in resistance were observed, the greatest difference being between the guinea-fowl and the duck. In the 4 hybrids studied the ratio of domestic to guinea-fowl haemoglobins averaged 1:1. It is not known whether the hybrids have one haemoglobin molecule with 2 antigenic determinants or whether they have 2 types of haemoglobin. It is suggested that the alkali denaturation method might profitably be used in combination with serological analyses in studying the properties of distant hybrids. (Animal Breeding Abstracts)

HLEBAROV, G. S., and **A. T. SABALINA** 1959. Izsledvanija varhu rasteza i razvitieto na piletata ot novosazdavastata se kokosa poroda za jaica i meso za Iztocna Balgarija.

GROWTH AND DEVELOPMENT OF A NEW DUAL-PURPOSE BREED OF FOWL IN EAST BULGARIA. *Izv. Inst. Zivotn. (Sofija)*, 10: 279-309. (Russian and German summaries.)—The Bulgarian Large Black fowl was developed from Black Shumen × Rhode Island Red; it is characterised by a live weight of over 2.100 kg., production in the pullet year of 150 eggs, and egg weight of 57 g. Body weight at all periods to 6 mths. of age was greater than that of the Shumen fowl, averaging at 6 mths. 2.1762 kg. for ♀♀ and 2.7844 kg. for ♂♂. The yield of meat and the weight of the internal organs were greater in the Bulgarian Large Blacks than in the Shumens; they matured earlier and utilised food more efficiently. The characters of a partridge-coloured variety of the Bulgarian Large Black were particularly good.—Abstract of summaries. (Animal Breeding Abstracts)

HOGSETT, M. L. 1959. [Iowa State Coll., Ames.]

GENETIC ANALYSIS OF PERFORMANCE FACTORS IN WHITE LEGHORN PURE STRAINS AND STRAIN CROSSES. *Diss. Abstr.*, 19: 2217. (Animal Breeding Abstracts)

HOHLS, H. W. Mastfahigkeitsvergleich zwisihen Leghorn u. Cornish × White Rock-Kreuzung bei drei verschiedenen Futtermischungen.

COMPARISON OF FATTENING CAPACITY OF LEGHORNS AND CORNISH × WHITE ROCK ON THREE DIFFERENT FEEDS. *Arch Geflugelk.*, 1959, 23, 338-348. (Bundesforschungsanst Kleintierzucht, Celle.) English summary.—(Nutrition Abstracts & Reviews)

HORT, J., and **T. HRABA** 1960. (Dep. Exp. Biol. Genet., Inst. Biol., Czechoslovak Acad. Sci., Prague.]

DEMONSTRATION OF PARENTAGE IN CHICKENS BY MEANS OF POOLED POLYVALENT ANTISERA. *Folia biol (Praha)*, 6: 116-120. (Russian summary).—(AnimalBreeding Abstracts)

HUTT, F. B. 1959. [Dep. Poult. Husb., Cornell Univ., Ithaca, N.Y.]

SEX-LINKED DWARFISM IN THE FOWL. *J. Hered.*, 50: 209-221.—A sex-linked recessive gene, *dw*, was found to reduce body weights of homozygous ♂♂ by about 43% below normal and those of hemizygous ♀♀ by 26 to 32%.

Chicks that later become dwarfs are normal in size if hatched from eggs of normal size, but by 2 wks. of age retardation of growth has begun.

Dwarfs grow at a slower rate than their big siblings, but without any abrupt cessation of growth up to 26 wks., at least. Those hatched from small eggs remain smaller for many weeks than those hatched from big eggs.

Viability, fertility and hatchability of eggs are as good in these dwarfs as in larger birds. However, in 4 sire families, egg production of 249 dwarf ♀♀ was 7.9 to 13.3% below that for their 222 big sisters and half-sisters. Average egg size for the dwarfs was 4.8 to 6.5 g. smaller than those for their big sisters.

Effects of this type of dwarfing on the skeleton, as shown by lengths of the 3 long bones of the leg, are compared with those of 4 other kinds of genetic dwarfing in the fowl. All 3 bones are shortened more, and more uniformly, in dwarfs than in creepers.

The gene *dw* is remote from *B* (barring) and shows crossing-over of 6.6% with *K* (slow feathering), and 7.0% with *S* (silver). The probable order of these genes in the chromosome is *B-S-K-dw*.—Author's summary. (Animal Breeding Abstracts)

KAN, J., W. F. KRUEGER, and **J. H. QUISENBERRY** 1959. (Texas Agric. Exp. Sta., College Station.]

NON-ADDITIVE GENE EFFECTS OF SIX BROILER TRAITS AS STUDIED FROM A SERIES OF DIALLEL MATINGS. *Poult. Sci.*, 38: 972-981.—A total of 119 diallel analyses were used to investigate the importance of non-additive gene effects in 6 broiler traits, namely, 4-wk. weight, 9-wk. weight, gain in weight from 4 to 9 wks., shank length, keel length, and body depth at 9 wks. of age. Two types of evidence suggested that in the Leghorns, the New Hampshires, and the reciprocal crosses between these 2 breeds, non-additive gene effects contributed to the variation in shank length, keel length, body depth, and possibly gain in weight. Non-additive gene effects appeared to have little or no influence on 4- and 9-wk. body weight. The first evidence came from a study of the frequency distribution of the F test in different replications. The second was derived from the estimation of the magnitude of the non-additive gene effects as measured by the sire × dam interaction component. Non-additive gene effects were of considerable importance in contributing to the variation in shank length, keel length, and body depth, but were of questionable significance as a contributor to the variation in gain in weight from 4 to 9 wks. and appeared to have little or no effect on body weight at either 4 or 9 wks of age.—From authors' summary. (Animal Breeding Abstracts)

KAN, J., N. R. GYLES, and **R. M. SMITH,** 1959. [Dep. Anim. Industr. Vet. Sci., Univ. Arkansas, Fayetteville.]

NON-ADDITIVE GENETIC VARIANCE OF EIGHT-WEEK BODY WEIGHT AS STUDIED BY THE ANALYSIS OF DIALLEL MATINGS. *Poultry Sci.*, 38: 486-487.—A diallel mating experiment with White Wyandottes and New Hampshires served to determine the non-additive genetic variance of 8-wk. body weight from the sire×dam interaction component. This component was present, since significant values were obtained by comparing the interaction mean squares with the error mean squares. (Animal Breeding Abstracts)

KAWAHARA, T., and **S. ICHIKAWA** 1959.

A COMPARATIVE ANALYSIS OF BODY WEIGHT IN TWO PUREBREEDS AND THEIR RECIPROCAL CROSSBREEDS IN THE DOMESTIC FOWL. *Rep. nat. Inst. Genet. Jap. (Misima, Sizuoka-Ken)*, No. 9 (1958). 81-82.—During a 3-yr. period (1956-58) intra- and inter-breed matings involving White Leghorns and Barred Plymouth Rocks were practised. The mating systems were such that the pure and the crossbred birds were half-sibs. Measurements of body weight were made at 0, 4, 8, 12 and 18 wks. of age. A heterotic effect on body weight was observed at 4 wks. of age; thereafter the weights of the crossbreds tended to be intermediate between those of the parents. The ♂ W.L. × B.P.R. cross was significantly heavier at 12 and 18 wks. of age than was the reciprocal cross. During growth, and particularly from 4 to 12 wks. of age, body weight was much more variable in the pure breeds than in

the crosses, indicating a more effective homeostasis in the latter. (Animal Breeding Abstracts)

KAWAHARA, T. 1959.
INFLUENCE OF HETEROSIS ON VIABILITY OF F_1 HYBRIDS BETWEEN TWO BREEDS OF THE DOMESTIC FOWL. *Rep. nat. Inst. Genet. Jap. (Misima, Sizuoka-Ken)*, No. 9 (1958): 82-83.—White Leghorns, Barred Plymouth Rocks, and their reciprocal crosses were maintained without culling to 18 wks. of age. The mortality of the crossbreds was 5.7% less than that of the pure breeds, the difference being significant at the 1% level. Mortality was greater (but not significantly so) in B.P.R. than in W.L. purebreds (11.5% *v.* 8.3%) and in ♂ W.L. × ♀ B.P.R. crosses than in ♂ B.P.R. × ♀ W.L. crosses (4.9% *v* 3.2%). (Animal Breeding Abstracts)

KING, S. C., J. R. CARSON, and **D. P. DOOLITTLE** 1959. (Poult. Res. Branch, U.S. Dep. Agric., at Purdue Univ., Lafayette, Ind.)
THE CONNECTICUT AND CORNELL RANDOMBRED POPULATIONS OF CHICKENS. *World's Poult. Sci. J.*, 15: 139-159.—The problems involved in establishing genetic and environmental controls are set forth and the procedures decided upon to solve these problems in the Northeastern Regional Poultry Breeding Project (NE-6) described. Also, an outline is given of the origin of the Connecticut and Cornell randombred populatons of domestic fowls, and the ways in which they can be utilised are indicated. (Animal Breeding Abstracts)

KNIZE, B. 1959. [Dep. Genet., Moscow State Univ.]
RECIPROCAL CROSSING OF CONTRASTING BREEDS OF POULTRY. *Folia biol. (Praha)*, 5: 285-291. (Russian summary.)—In order to determine the effect of the direction of the cross on the performance of crossbred pullets a study was made of ♂ White Leghorn × ♀ Bantam and ♂ Bantam X ♀ White Leghorn crosses. Pullets of the parental breeds were used as controls. Day-old crossbred chicks were similar in weight to chicks of the maternal breed, but the weight difference between the reciprocal crosses decreased with age until at 5-6 mths. both groups were approx. the same weight. By 10 mths. of age, however, the ♂ Leghorn × ♀ Bantam pullets had surpassed the pullets of the reciprocal cross in body weight, showing the influence of the paternal breed. Body conformation and relative measurements showed a similar trend. At 7 days they tended to resemble those of the maternal breed, while at 500 days the paternal effect predominated.

Sexual maturity was attained soonest by the control Leghorns and by the ♂ Bantam × ♀ Leghorn crosses, indicating a maternal influence on this trait. The earlier sexual maturity was probably associated with the slower growth rate of the ♂ Bantam × ♀ Leghorn pullets compared with the reciprocal cross. A paternal influence was observed on av. egg weight, broodiness, egg numbers, and total weight of eggs. The fact that av. egg weight was higher in the ♂ Leghorn × ♀ Bantam pullets than in the reciprocal cross might be explained partly by the larger body size of pullets of the first named cross. The best layers, both as regards number of eggs and total weight of the eggs, were the control Leghorns, followed by the ♂ Leghorn × ♀ Bantam hens, which actually surpassed the purebred Leghorns in respect of weight of egg per kg. body weight. (Animal Breeding Abstracts)

KOMAI, T., J. V. CRAIG, and **S. WEARDEN.** 1959. [Kansas State Coll., Manhattan.]
HERITABILITY AND REPEATABILITY OF SOCIAL AGGRESSIVENESS IN THE DOMESTIC CHICKEN. *Poultry Sci.*, 38: 356-359.—Hens of 6 strains belonging to 4 breeds were used to study genetic variation in social aggressiveness and repeatability of social status of the strain. From the frequency of fights, pecks, threats, and avoidances among birds in purestrain and intermingled flocks the percentile social ranks (percentages of birds dominated) of the individuals and their ordered ranks (the most aggressive bird ranking highest) were determined. Genetic variation in social aggressiveness,

estimated at 0.30 and 0.34 from the mean percentile and ordered ranks resp., appears to allow effective selection. High repeatability (0.857) in social standing of the ♂ strains demonstrates that it is largely based on hereditary differences. (Animal Breeding Abstracts)

KUSNER, H. F. 1958. Effektivnostj dvuhporodnogo peremennogo skrescivanija v pticevodstve.
THE EFFECTIVENESS OF TWO-BREED CRISSCROSS BREEDING IN POULTRY. *Trud. Inst. Genet. (Mosk.)*, No. 24: 288-293.—Another account of this work has already been abstracted (*see A.B.A.*, 26, No. 417).(Animal Breeding Abstracts)

KUSNER, H. F., E. V. TOLOKONNIKOVA, and **I. G. MOISEEVA** 1959. [Inst. Genet., Acad. Sci. U.S.S.R., Moscow.] Izmenenie okraski operenija u potomstva kur v rezuljtate vlivanija im razlicnyh komponentov cuzerodnoi krovi
CHANGES IN PLUMAGE COLOUR OF THE PROGENY OF FOWLS AS A RESULT OF INJECTING THEM WITH DIFFERENT COMPONENTS OF THE BLOOD OF OTHERS. *Dokl. Akad. Nauk SSSR*, 129: 674-677.—In the 3 yrs. 1956-57 to '58-59 experiments were made with 3 generations derived from White Leghorn pullets injected with blood plasma or with the cellular portion of the blood of New Hampshires, and then mated with untreated White Leghorn cocks. In the first year 43 F_1 chicks were hatched in the plasma-injected group and 86 in the cell-injected group; 10 and 1 progeny resp. had pigmented patches on the plumage. When white F_1 ♀♀, whether or not they were themselves injected with plasma, were mated with F_1 ♂♂, they produced no progeny with pigmented patches. When the F_1 ♀♀ with pigmented patches, injected or not injected with plasma, were mated with F_1 ♂♂, 11.4 and 11.1% resp. of the chicks had pigmented patches. Only 3.7 and 2.4% of the progeny had pigmented patches in the cell-injected group produced by white or pigmented cell-injected hens resp. Similar results were obtained in the 3rd generation when both the parents were injected. It is concluded that the percentage of pigmented progeny was lower and the degree of pigmentation was less when blood cells with a high DNA content were injected than when plasma with presumably only traces of DNA and a high protein content was injected. (Animal Breeding Abstracts)

LACZA, B. 1959. [Res. Inst. Breed. Farm Anim., Godollo.] A nemesitett magyar lud.
THE IMPROVED HUNGARIAN GOOSE. *Kiserl Kozl., Allattenyeszt.*, 1958 (2): 23-33. (Russian and German summaries.) (Animal Breeding Abstracts)

LANDAUER, W. 1959. [Storrs Agric. Exp. Sta. Univ. Connecticut, Storrs.]
A LETHAL MUTATION IN DORKING FOWL. *J. Hered.*, 50: 137-139.—A recessive mutation has been found in Dorking fowl which causes death of the embryos during the 8th or the beginning of the 9th day of incubation. The body size of such embryos is somewhat reduced, the neck is very short, the beak is abnormal, the tail is often short and the eyes tend to be more heavily pigmented than those of their normal sibs.—Author's summary. (Animal Breeding Abstracts)

MARCHLEWSKI, T. and **B. BORZEDOWSKA** 1959. (Dep. Anim. Genet., Jageelonian Univ., Cracow.)
A POSSIBLE CASE OF GENETIC TRANSDUCTION IN THE DOMESTIC FOWL. *Folia biol. (Warsz)*, 7: 259-266. (Polish and Russian summaries.)—The salient points of experiments carried out by Borzedowska on transmissible phenotypic effects caused by tranferring albumen from Polish Greenleg to (White) Leghorn eggs (*see A.B.A.*, 24, No. 1313 and 26, No. 989), and also of related experiments, are recapitulated. Reasons are given why it is unlikely that the changes observed in the plumage colour of the offspring were due to a "floating gene" in the flock or to accidental crossing of the experimental Leghorn hens with Rhode Island Red or Polish Greenleg cocks. Data on the F_2 progeny

of the changed, partially coloured fowls indicate that the new feature is being slowly incorporated into the new genotype. Although no reliable interpretation of the results is possible at this stage, genetic transduction induced by the foreign deoxyribonucleic acid seems to be the most likely explanation. (Animal Breeding Abstracts)

McDONOGH, S. and **E. BANNIGAN** 1959. (Dep. Agric., Dublin.)
REPORT ON TURKEY EXPERIMENTS CARRIED OUT IN THE TURKEY BREEDING UNIT AT ATHENRY AGRICULTURAL SCHOOL, 1957. *J. Dep. Agric.* (Dublin), 55: 31-87.—Of the 5 sections in the report, 4 describe nutritional experiments the first of which compared the performance on low- and high-protein starting mashes of 5 imported and 3 native varieties: Empire White, Broadwhite, Michigan White, Beltsville White (1955 and 1956 Strains), and Broad Breasted Bronze, American Bronze and Native White resp. The large white varieties, represented by the first three named, appear to be the most promising for exploitation in Ireland, but the Beltsville Whites meet demands for a smaller bird and have high reproductive ability. Breast width of the American Bronze and Native White varieties was about 50% less than that of the Empire White.

Section 2 consists of a single table comparing the 5 imported varieties in respect of breeding performance, and all 8 varieties in respect of live weight, food consumption and conversion rate, and breast width at 24 wks. of age. Fertility, hatchability of fertile eggs, and poults per hen were 93%, 87 and 35 resp. for the 1956 Beltsville Whites *v.* 79%, 76 and 30 for the next best, the Broadwhites. (Animal Breeding Abstracts)

MELLEN, W. J. 1959. (Dep. Anim. Poult. Industr., Univ. Delaware, Newark.]
HEREDITARY EXENCEPHALY IN THE FOWL. *J. Hered.*, 50: 127-130.—An inherited exencephaly was discovered in S.C. White Leghorns of the University of Delaware strain. The condition was recessive, but the exact mode of inheritance was not apparent. Among exencephalic chicks, there was a wide range of expression of the trait, ranging from minute hydrencephalocele to massive herniation of the brain. No other gross abnormalties were apparent. Most exencephalic birds died in early life, but several were reared to maturity and used in breeding tests.—Author's summary. (Animal Breeding Abstracts)

MERAT, P. 1959. [Sta. Rech. Avicol., Jouyen-Josas, Seine-et-Oise.] Segregation anormale pour les alleles "crete simple" et "crete en rose".
ABNORMAL SEGREGATION OF THE ALLELES "SINGLE COMB" AND "ROSE COMB". *Ann. Zootech. (Paris)*, 8: 178.—Deviations from the theoretical segregation ratio of the alleles *R* (rose comb) and *r* (single comb) are reported in a flock of fowls. In crosses of *Rr* ♂♂ with *rr* ♀♀ and *rr* ♂♂ with *Rr* ♀♀ over 8 seasons, although the ratio of *R* to *r* in ♀♀ did not vary appreciably from 1:1, there was a significant ($P<0.01$) reduction in rose comb ♂♂ over the first 3 seasons. The abnormal proportions were found to be associated with certain *Rr* ♂♂, while certain *Rr* ♀♀ also had ♂ descendants in the abnormal proportions. On the available data it is difficult to explain the deviation by differential embryonic or post-embryonic mortality. (Animal Breeding Abstracts)

MERAT, P. 1959. [Sta. Rech. Avicol., Centre Nat. Rech. Zootech., Jouy-en-Josas, Seine-et-Oise.] Genetique factorielle et production chez les volailles. II.—Barrure liee au sexe et croissance en poids. III.—"Blanc dominant" et croissance en poids.
FACTORIAL GENETICS AND PRODUCTION IN POULTRY. II. SEX-LINKED BARRING AND GROWTH RATE. III. "DOMINANT WHITE" AND GROWTH RATE. With the technical collaboration of A. Argand and A. Bouchardeau. *Ann. Zootech.* [*Paris*], 8: 39-47, 49-55. [English summaries.]—II. A comparison was made of 4-, 8-, or 12-wk. body weights of 4 generations of spring- and autumn-born

chicks of the Gatinaise and Marans breeds. They were members of the same full-sib families and carried the gene for barring [*B*] and wild type *(b)*. In one population the body weight of non-barred ♀♀ was significantly greater than that of barred ♀♀ (about 30 g. at 8 wks.), and they had a significantly lower phenotypic variance in weight. These tendencies were less marked in ♂♂. Other crosses, involving the barring factor, examined under similar conditions did not exhibit these differences. Several hypotheses to explain this phenomenon are advanced.

III. Chicks, heterozgous for the inhibitor of black pigment *(Ii)* or carriers of the recessive wild allele *(ii)*, and originating from the same full-sib families, were compared for 8-wk. weight or, in certain cases, for 4-wk. weight. In several crosses, highly significant differences were found in favour of wild type ♀♀ of the order of 30 g. at 8 wks. On the other hand, dominant white ♀♀ showed greater phenotypic variance. Comparable differences were not found in ♂♂. The parallel betwen these results and those in the literature suggest a pleiotropic action of *I* and *i*, but further research is necessary before this can be established. (Animal Breeding Abstracts)

MITSUMOTO, T. 1959. [Dep. Anim. Husb., Tohoku Univ., Sendai.]
AN ATTEMPT TO PRODUCE QUAIL-CHICKEN HYBRIDS. *Tohoku J. agric. Res.*, 10: 59-63.—Of 149 eggs obtained from 3 quails *(Coturnix coturnix japonica)* artificially inseminated with domestic fowl semen, 8 showed embryonic development. The stages of development reached, in terms of the equivalent development of normal quail embryos, were 2-3 days (5 embryos), 5 days (2 embryos) and 9-10 days (1 embryo). In a 2nd series of experiments, 4 out of 11 eggs showed some embryonic development. Two embryos reached the 2- to 3-day stage and 2 the 5-day stage. Histologically, the hybrid embryos did not differ from normal quail embryos, but various cytological abnormalities were observed.

Of 86 eggs obtained from 2 domestic hens artificially inseminated with quail semen, none showed embryonic development. Quail serum was found to cause agglutination and inactivation of fowl spermatozoa. (Animal Breeding Abstracts)

MORGAN, W. 1960. [South Dakota Agric Exp. Sta., Brookings.]
SUPERFICIAL PHENOTYPES. *Proc S. Dak. Acad. Sci.*, 1959, 38: 151-154.—In some breeds (*e.g.* Barred Plymouth Rock, White Plymouth Rock, Rhode Island Red) the combs of laying hens are much smaller than those of the cocks, while in others *(e.g.* White Leghorn, New Hampshire) they may be as large or larger. An examination of several New Hampshire hens with male-type heads (2 being non-layers) revealed that none possessed testes. The most unusual case of acquired ♂ characteristics observed by the author was in a White Leghorn hen which developed ♂-type plumage after having laid normally, and which continued to lay at a relatively high rate after the appearance of the abnormal plumage. The eggs showed 80% hatchability. Some possible reasons are given for the relatively large number of reports of hen-to-cock changes. (Animal Breeding Abstracts)

MOSKALENKO, H. S. 1957. Tempy rosta cypljat porody leggorn belyi i pomesei leggorn×rod-ailend.
THE RATE OF GROWTH OF WHITE LEGHORN AND LEGHORN×RHODE ISLAND CHICKS. *Bjull. nauc.-teh. Inform. stavropoljsk. nauc.-issled. Inst. Sel-hoz.*, 1957 (3): 49-51. From abstract in *Referat. Z., Biol.*, 1959 (1), No. 2720.—In Leghorns body weight is low and meat quality poor. The egg production of Leghorn×Rhode Island crossbreds was not appreciably different from that of the Leghorns, meat quality was good and food utilisation was more efficient than in the Rhode Islands. Average daily weight gain to 100 days was 8.61 g. for the Leghorns and 11.36 g. for the crossbreds. (Animal Breeding Abstracts)

NALIBOCKII, S. B. 1958. Biologiceskie i hozjaistvenno-produktivnye svoistva mestnyh belorusskih gusei.

BIOLOGICAL AND ECONOMICALLY-PRODUCTIVE CHARACTERS OF LOCAL WHITE-RUSSIAN GEESE. *Nauc. Trud. belorussk. Inst. Zivotn.*, 1: 248-263.—In Oct. 1956 at collective farms in White Russia there were 234,600 geese representing 27.3% of the poultry. In 1950 geese were inspected in a number of districts and 1785 adults were examined at 13 collective farms; additional data were obtained from 2 collective farms in 1952-54. In different districts the colour of the geese varied, white or white with some dark grey or grey predominating. They are distinguished by compact conformation, a relatively short neck and a short straight yellowish-orange beak; the body is shorter and the breast girth is less than in most breeds. Body weight is low; in different distrcts the average varied between 4.1 and 5.2 kg. for ♂♂ and 3.7 and 4.3 kg. for ♀♀. Egg production varied between 4.7 and 9.5 eggs; the eggs were laid in March-April and averaged 160.8 g. (100-205). Of 490 eggs examined 93.5% were fertile and with natural incubation 75.5% hatched. Growth was not appreciably different from that of Tambov geese, a body weight of 4.5 kg. being reached at 4 mths. of age. During fattening for 18 days at 7-8 mths. of age body weight increased by 30.6-31.5%. Details of fattening are compared with those for Chinese geese. (Animal Breeding Abstracts)

NEWCOMER, E. H. 1959. [Dep. Bot., Univ. Connecticut, Storrs.]

THE MEIOTIC CHROMOSOME OF THE FOWL. *Cytologia (Tokyo)*, 24: 403-410.—From a study of the meiotic chromosome cycle in the gonads of sexually mature cockerels additional evidence for the non-chromosomal status of the so-called micro-chromosomes or chromosomoids was obtained *(cf. A.B.A.*, 26, No. 1021). These nuclear constitutents appear to possess no centromeres. They may either segregate precociously or lag in disjunction, and their distribution to the daughter nuclei is only roughly quantitative. With the reductional disjunction there is a marked reduction in the number and volume of the chromosomoids, which have virtually disappeared by 2nd metaphase and anaphase. The heterochromatic origin, fluctuation in numbers, and behaviour of the chromosomoids during the mitotic and meiotic cycles (particularly their partial or complete disappearance when intracellular syntheses appear to be suspended) suggest that they may constitute a reserve supply of nucleic acids for chromosome replication. They appear not to be genetically inert and may have a quantitative, polygenic effect on the genome, as well as influencing linkage relations. (Animal Breeding Abstracts)

NEWCOMER, E. H. 1959. [Dep. Bot., Univ. Connecticut, Storrs.]

CHROMOSOMAL TRANS-LOCATION IN DOMESTIC FOWL INDUCED BY X-RAYS. *Science*, 130: 390-391.—A reciprocal chromosomal translocation involving the 1st and 2nd chromosomes was demonstrated cytologically in a ♂ White Leghorn fowl produced from unpedigreed random matings in which the semen was exposed to 1000 r-units per generation in each of 4 generations. The observations confirmed that the ♂ domestic fowl carries only 6 haploid chromosomes. The other elements ("chromosomoids") appear to be adjuvant in nature and function. (Animal Breeding Abstracts)

OHNO, S., W. D. KAPLAN and **R. KINOSITA** 1960. (Dep. Exp. Path. Genet., City of Hope Med. Center, Duarte, Cailf.)

ON THE SEX CHROMATIN OF *GALLUS DOMESTICUS*. *Exp. Cell Res.*, 19: 180-183.—The occurrence of sex chromatin in somatic nuclei of *Gallus domesticus* ♀♀ is confirmed. As the ♀ is the heterogametic sex, with only one Z chromosome, the sex chromatin cannot rerpesent fused heterochromatic regions of the 2 sex chromosomes of the homogametic sex, as had been previously supposed. Observations on squash preparations of embryonic skin and liver cells indicate that the sex chromatin present in ♀♀ represnts a single Z chromosome in positive heteropycnosis. The arms of the mediocentric Z chromosome

are bent back upon each other during interphase, giving a bipartite appearance to the sex chromatin. Neither of the Z chromosomes of the ♂ displays positive heteropycnosis. (Animal Breeding Abstracts)

OSBORNE, R. 1959. [Hall-Mark Hatcheries, Ltd., Wickford, Essex.]
THE SCOTTISH POULTRY PROGENY TESTING SCHEME. *World's Poult. Sci. J.*, 15: 160-166.—A short account is given of the test, for which the 1st entries were received in March 1958 and of its relationship to current breeding activities on the individual farms in Scotland. (Animal Breedng Abstracts)

PENIONZKEVIC, E. E., I. K. SAVELJEV, and **A. P. CMUTOVA** 1958. Novaja zagorskaja porodnaja gruppa kur.
THE NEW ZAGORSK BREED GROUP OF HENS. *Trud. vsesojuz. nauc.-issled. Inst. Pticev.*, 25: 49-101.—The breed, its formation, characters and performance, are described in greater detail than in a previous paper in which the 2 senior authors collaborated (*see A.B.A.*, 27, No. 452). (Animal Breeding Abstracts)

PENIONZKEVIC, E. E., and **G. A. MISIN.** 1959. Izmenenie nasledstvennosti u belyh leggornov v rezuljtate in 'ekcii im krovi seryh cesarok.
CHANGES IN INHERITED CHARACTERS OF WHITE LEGHORNS AS A RESULT OF INJECTING THEM WITH THE BLOOD OF GREY GUINEA-FOWL *Pticevodstvo*, 9(8): 32-33.—On the 4th and 5th day of life 10 ♂ and 45 ♀ White Leghorn chicks were subcutaneously injected with 0.5 cm.³ guinea-fowl blood and thereafter they were injected intraperitoneally with increasing doses of blood until the dose was 5.0 cm.³; a total of 150 cm.³ was given by 6 mths. of age. Of the ♀♀ 36 came into lay and each was artificially inseminated with mixed semen of the 10 ♂♂. When adult, the ♂ and ♀ birds had larger and smoother combs than are normal for W.L.s. The shells of 128 out of 528 eggs had an abnormal pink tinge and some of the shells were speckled like guinea-fowl egg shells; all eggs with abnormal shells were laid by 9 hens. The eggs of the injected ♀♀ hatched 4 days later than was normal for fowl eggs. The eggs and beaks of the progeny were not the normal yellow of W.L.s; in 12 out of 48 they were greenish-pink. (Animal Breeding Abstracts)

PODHRADSKY, J. 1959. [Agric. Coll., Brno.] Hodnoceni uzitkovosti slepic jako podklad pro vyber do kmenu.
THE EVALUATION OF PRODUCTION IN THE FOWL AS A BASIS FOR SELECTION IN THE FEMALE FLOCK. *Sborn. vysoke Sk. Zemed. Lesnicke* [*Brno*], *A*, 1959 1/2): 205-212. [Russian and German summaries].—Methods of dam-daughter evaluation are described. (Animal Breeding Abstracts)

POOLE, H.K. 1959. [Anim. Husb. Res. Div., U.S. Dept Agric Beltsville, Md.]
THE MITOTIC CHROMOSOMES OF PARTHENOGENETIC AND NORMAL TUKEYS. *J. Hered.*, 50: 150-154.—A study was made of squash preparations of developing pin-feathers from 4 parthenogenetic Beltsville Small White turkeys (♂♂), 3 of which had yielded small amounts of semen containing motile spermatozoa. Morphologically and numerically the chromosome complements of the parthenogenetic birds were similar to those found in normal turkeys. The sex chromosome appeared to be the 6th largest macrochromosome. Cytological mechanisms whereby diploid parthenogenesis may arise are discussed briefly. (Animal Breeding Abstracts)

QUISENBERRY, J. H. 1959. [Texas Agric. Mech. Coll. System, College Station.]
HISTORY AND DEVELOPMENT OF THE SOUTHERN REGIONAL POULTRY BREEDING PROJECT. *Poult. Sci.*, 38: 864-868.—The project, which was begun in 1947, covers 13 southern States of the U.S.A. (Animal Breeding Abstracts)

RAUCH, W. 1959. [Bundesforsch Anst. Kleintierz., Celle.] Mathematisch-statistische Beziehungen zwischen Eiqualitatsmerkmalen. (Korrelationen und Regressionen.)

MATHEMATICAL-STATISTICAL RELATIONSHIPS BETWEEN EGG QUALITY CHARACTERS. (CORRELATIONS AND REGRESSIONS.) *Arch. Geflugelk.*, 23: 108-121. (English Summary.)—The relationships between the following egg quality characters were investigated in a total of 3582 eggs from laying hens of 6 different breeds; egg weight, egg number, shell thickness and breaking strength, yolk height and index, and albumen height and index. Significant correlations were found between (1) shell thickness and breaking strength ($r = +0.55$), (2) yolk height and index ($r = +0.83$), (3) albumen height and index ($r = +0.94$), (4) yolk and albumen height ($r = +0.51$), (5) albumen and yolk index ($r = +0.40$), (6) shell breaking strength and egg number ($r = -0.11$), and (7) shell breaking strength and egg weight ($r = +0.11$). The main conclusion drawn is that selection for egg quality in hens will not have an unfavorable effect on egg production. (Animal Breeding Abstracts)

REYNTENS, N., and F. OKERMAN 1959. (Sta. Petit Elev. Etat, Gontrode.) Essai comparatif de differentes races et croisements de poulets a engraisser.

COMPARATIVE STUDY OF DIFFERENT BREEDS AND CROSSES OF FOWL FOR FATTENING. Translated from the Dutch. *Rev. Agric. (Brux.)*, 12: 35-58.—The trials were carried out at Gontrode to find the most suitable breed or strain in Belgium for broiler fowl production. Ten entries were received, each containing 180 hatching eggs, of 3 pure breeds and the remainder crossbreeds, 3 of which contained Cornish blood. Hatchability averaged 77.78% (70.06-86.59). A total of 839 unsexed chicks were reared on the floor and the others were sexed and reared in batteries. Results are tabulated. On deep litter the av. weight of the heaviest group of ♂♂ at 11 wks. was 2268.8 g. and of the lightest 1875 g.: in batteries the corresponding weights were 2201.9 g. and 1684 g. resp. For ♀♀ reared on deep litter weights were 1769 g. and 1496 g. resp.: in batteries they were 1843.2 g. and 1391.3 g. resp. In Belgium the most popular fowls are those with white feathers, but in certain regions, where there is a bigger demand for the yellow variety, Holland Blues fetch better prices. Carcass quality studies are to be the subject of a later paper. (Animal Breeding Abstracts)

ROMANOVSKII, D. M. 1958. Effektivnostj primenenija mezporodnyh skrescivanii kur v pticesovhozah.

THE EFFECTIVENESS OF CROSS-BREEDING WITH FOWLS AT STATE FARMS FOR POULTRY BREEDING. *Trud. Inst. Genet. (Mosk.)*, No. 24: 294-306.—At Pancirevskii State Farm, White Plymouth Rock or Australorp ♂♂ were used on Rhode Island Red × Leghorn crossbreds. Egg production of the 3-breed crosses was greater than that of the Plymouth Rocks and compared favourably with that of Russian Whites, especially durng the winter months.

At Zaoksk State farm the White Zaoksk fowl was developed from Plymouth Rocks and Leghorns. Accounts are given of obtaining crossbreds from Leghorns × New Hampshires, Rhode Island Reds, Australorps or Kuchins, Leghorns × Pervomais, Russian Whites × R.I.R., Wyandotte or local Ural cocks, and from Russian Whites × Australorps or Pervomais. The egg production of these crossbreds is compared with that of established breeds at laying trials. (Animal Breeding Abstracts)

RYSKENS, A. 1959. Dix ans de selection avicole.

TEN YEARS OF SELECTION IN POULTRY. *Rev. Agric. (Brux.)*, 12: 251-272.—An examination is made of the poultry industry in Belgium as it has evolved during the last 10 yrs., in particular the commercial hatcheries and the increase in incubators, the evolution of the various breeds and crosses, and the changes that have taken place in the field of egg and broiler production. Two outstanding developments have taken place in the evolution of breeds and crosses: (1) there has been a marked decline in the White Leghorn breed and (2) there has

been a big increase in the number of crossbred fowls at the expense of the pure breeds both for egg and broiler production. Rhode Island Reds are becaming extensively used both as purebreds and for crossing. Broiler production is rapidly on the increase, and it is estimated that more than 20 million were produced in 1958. (Animal Breeding Abstracts)

SAKATUNOV, S. V. 1960. Gde ze russkaja poroda jurlovskih golosistyh kur?

WHERE IS THE YURLOV CHANTING BREED OF RUSSIAN FOWL? *Zivotnovodstvo,* 22(3): 23.—Until the last 5 yrs. the Yurlov chanting breed was considered to be outstanding for both egg and meat production. No reference to it has appeared for a number of years. The author suggests restoring it. (Animal Breeding Abstracts)

SAVELJEV, I. K. 1959. Vybor porod kur dlja polucenija pomesei i nekotorye osobennosti vyrascivanija mjasnyh cypljat.

THE SELECTION OF BREEDS OF FOWL TO PRODUCE CROSSBREDS AND FACTORS IN REARING CHICKS FOR MEAT. *Ptícevodstvo,* 9(9): 6-12.—Management and nutrition for obtaining meat birds at 90 days of age are considered. Fattening characters were studied in Zagorsk fowls in 1958, and in 1959 in crossbreds from White Plymouth Rock, New Hampshire or Kuchin Anniversary cocks used on Zagorsk hens. At 90 days body weight was greatest, carcass quality was best and food utilisation most efficient in the crossbreds sired by Kuchin Anniversary ♂♂. In the other crossbreds these characters were no better than in purebred Zagorsks. (Animal Breeding Abstracts)

SCHRODER, V. N. 1960. [A. N. Severcov Inst. Anim. Morph., Acad. Sci. U.S.S.R., Moscow.] Fiziologo- biohimiceskaja osnova voznikno-venija pola u zivotnyh.

PHYSIOLOGICAL-BIOCHEMICAL BASIS OF THE SEX RATIO IN ANIMALS. *Zivotnovodstvo,* 22(2): 66-74.—Details are repeated of a paper already abstracted [*see A.B.A.*, 25, No. 896]. Further experiments were carried out with 70 ♀ and 14 ♂ Zagorsk White Fowls. When glucose, glycocol, ascorbic acid and nicotinic acid were added for 14-26 days to the ration of hens mated to cocks fed the normal ration, 64-77% of the chicks were ♀♀; this percentage was reduced when the supplementary ration was fed to both ♂♂ and ♀♀. When methylthiouracil was substituted for the 2 acids in the supplementary ration and fed to the ♀♀ only, 48-61.5% of the chicks were ♀♀; when fed to both ♂♂ and ♀♀ the perecntage of ♀♀ was reduced. Biochemical processes occurring in the embryonic tissues after 5, 6½, 8 and 10 days of incubation were sutdied. (Animal Breeding Abstracts)

SIEGEL P. B., and **ESSARY, E. O.** 1959. [Poult. Dep., Virginia Polytech. Inst., Blacksburg.]

HERITABILITIES AND INTERRELATIONSHIPS OF LIVE MEASUREMENTS AND EVISCERATED WEIGHT IN BROILERS. *Poult. Sci.*, 38: 530-532.—The heritability estimates of and interrelationships between 8-wk. breast angle, 59-day live weight, and 59-day eviscerated weight were determined in non-inbred White Rock ♂♂. Mean heritability estimates, based on half-sib and full-sib correlations, for the 3 traits were 0.40, 0.49 and 0.50 resp. Highly positive genetic and phenotypic correlations of 0.98 and 0.96 resp. were obtained between weight measurements, while those between breast angle and live and eviscerated weight were of a much lower order. (Animal Breeding Abstracts)

SKALLER, F. 1959. [Poult. Res. Centre, Werribee, Vict.]

BREEDING DOMESTIC FOWL FOR IMPROVED EGG PRODUCTION IN THE ENVIRONMENT OF THE SOUTH-WEST PACIFIC AREA. *World's Poult. Sci. J.*, 15: 27-34.—The influence of a tropical climate and of a low level of management and nutrition on poultry breeding for egg production are discussed. The need to de-

termine the most suitable genotype for an environment characterised by a tropical climate and low level of poultry husbandry is stressed. (Animal Breeding Abstracts)

SOPIKOV, P. M. 1958. Izmenenie nasiedstvennosti i povysenie ziznennosti zivotnyh putem parenteraljnyh vvedenii recipientam krovi i drug!h tkanei.

CHANGES IN INHERITED CHARACTERS AND INCREASED VITALITY IN ANIMALS BY PARENTERAL ADMINISTRATION TO RECIPIENTS OF BLOOD AND OTHER TISSUES. *Trud. vsesojuz. nauc.-issled. Inst. Pticev.*, 25: 101-132.—Work carried out at the Institute [including papers abstracted in *A.B.A.*, 20: No. 884, and 23. No. 1928.] since 1950 is summarised, and advantages of this method of hybridisation are stresssed. (Animal Breeding Abstracts)

SOROKIN, A., and **V. KOPYLOV.** 1960. Cto date kolhozu razvedenie gibridnyh kur.

THE CONTRIBUTION OF BREEDING HYBRID FOWLS TO THE COLLECTIVE FARM. *Kolhoz. Proizvod.*, 20(3): 27-28.—At the Collective Farm XX S'ezda KPSS, 4220 chicks of 4-line crosses developed from New Hampshires, Rhode Islands and Leghorns, and 2260 chicks of 4-line crosses of purebred Leghorns were compared with Russian White chicks. The pullets of all groups came into lay at 4-5 mths. of age. In the 1st year the 4-line crosses averaged 225.8 and 227.1 eggs resp. *v.* 132 for the Russian Whites. The 4-line crosses produced heavier eggs and utilised food more efficiently than dd the Russian Whites. (Animal Breeding Abstracts)

SPLITTGERBER, H., H. WIESENDAHL, and **B. MOBIUS.** Hahnchenmastversuch mit verschiedenen Rassen und Rassenkreuzungen.

COCKEREL FATTENING TRIAL WITH DIFFERENT BREEDS AND CROSSES. *Arch. Geflugelk.*, 1959, 23, 332-337. [Lehr-Versuchsanst. Kleintierzucht, Unna-Konigsborn.] English summary.—In a fattening trial from day-old to 8 weeks rate of feathering, weight gains, feed intake per kg. weight gain, slaughter losses and carcase quality of chickens of different breeds and crosses, 80 in each group, were estimated. The birds were kept on dry litter and were given all-mash rations.

Crossing did not always have a favourable effect on weight gains, *e.g.*, pure Sussex and White Rock, Sussex × White Rock and White Rock × Sussex birds gained, on the average, 928.2, 925.0, 990.5 and 893.4 g., respectively. The manner of crossing sometimes, but not always, affected weight gains.—I. R. Anderson. (Nutrition Abstracts & Reviews)

STOFFELS, J. 1958. Die Niederrheinische Legegans, der Heutige Zucht- und Markttyp.

THE LOWER RHINE LAYING GOOSE, PRESENT-DAY BREEDING AND MARKET-TYPE. *Dtsch. Wirtsch-Geflugelz.*, 10: 636-637.—The popularity of the Lower Rhine goose has been spreading throughout the Rhineland and Westphalia for the past 15 yrs., and it is now being bred in other districts in Germany. Many of these geese have also been exported to other countries, including America. It is a triple-purpose breed, producing eggs, feathers, and meat. Some data are given on a small rearing experiment. The av. body weight of 13 birds at 9 wks. of age ranged from 3.6 to 5.0 kg.; their total weight was 57 kg. (Animal Breeding Abstracts)

SVOBODA, A., H. HANUSCALKOVA, and **V. PUSTOWKA.** 1958. Biometrika skeletu trojmesacnych kohutikov—krizencov Leghorn biely × Rhode Island.

BIOMETRICAL STUDY OF THE SKELETON OF THREE-MONTH WHITE LEGHORN × RHODE ISLAND COCKERELS. *Pol'nohospodarstvo [Bratislava]*, 5: 1119-1137. [Russian and German summaries.]—Data on 103 bone measurements, from which indices were

calculated, are tabulated and compared with those for purebred Rhode Island cockerels. (Animal Breeding Abstracts)

SVOBODA, A. 1959. [Inst. Gen. Biol., Agric. Coll., Kosice.] Biometricke studium krizencov medzi leghornkami bielymi (♂) a rhode-islandkami cervenymi (♀).

A BIOMETRICAL STUDY OF WHITE LEGHORN (♂) AND RHODE ISLAND RED (♀) CROSSBREDS. *Polnohospodarstvo* [*Bratislava*], 6: 213-228. [Russian, German and English summaries.]—Body weight and 7 body measurements were compared in 70 White Leghorn ×Rhode Island Red crossbreds with those in purebred R.I.R.s at various ages.—Abstract of summaries. (Animal Breeding Abstracts)

SVOBODA, J., and **V. HASKOVA.** 1959. (Inst. Biol., Czechoslovak Acad. Sci., Prague.)

FAILURE TO PRODUCE SOMATIC CHANGES BETWEEN STRAINS OF DUCKS BY MEANS OF SPECIFIC DNA. *Folia biol.* [*Praha*], 5: 402-404. [Russian summary.]—Six drakes and 4 ducks of the Pekin breed each received 41 weekly injections of deoxyribonucleic acid obtained from Khaki Campbell erythrocytes, starting on the day after hatching. The total dosage was 172 mg. The experimental birds did not differ from untreated controls of the same breed in the pigmentation of the bill, the shape of the head, the shape or position of the tail, behaviour, gait, or av. body weight. Three of the experimental birds showed patches of pigment on the bill, but the same feature was observed in some of the controls. Further experiments are to be conducted with the object of investigating the posssible occurrence in higher animals of a process resembling bacterial transformation. (Animal Breeding Abstracts)

TOLOKONNIKOVA, E. V., and **I. G. MOISEEVA,** 1958. Vlijanie vvedenija cuzerodnoi krovi kuram na ih potomstvo.

THE EFFECT ON THEIR OFFSPRING OF INJECTING HENS WITH FOREIGN BLOOD. *Trud. Inst. Genet.* [*Mosk.*], No. 24: 372-384. [B.]—Work on vegetative hybridisation with animals and with poultry is reviewed, with a more detailed summary of work with blood injections carried out at the Institute of Genetics which has already been abstracted from a number of sources [*see A.B.A.*, 23, No. 1928, 24, No. 1911, 26, No. 2167.] (Animal Breeding Abstracts)

VAINIKAINEN, V. 1957. [Agric. Exp. Sta., Tikkurila.] Kukkojen vaihdosta siitosryhmissa.

CHANGING COCKS IN BREEDING GROUPS. *Maatalous ja Koetoim.*, 11: 37-40. [German summary.]—The maximum duration of fertilisation of eggs by a given cock after separation from the breeding group was investigated. The influence of the cock could still be detected 20 days after its removal, and it is suggested that a period of at least 3 wks. should be allowed to pass before remating in order to be certain of the paternity of the offspring. (Animal Breeding Abstracts)

VAN ALBADA, M. 1958. [Agric. Coll., Wageningen.] Der Entwicklungsgang der niederlandischen Geflugelzucht.

THE COURSE OF DEVELOPMENT OF DUTCH POULTRY BREEDING. *Dtsch. WirtschGeflugelz.*, 10: 931-934. (Animal Breeding Abstracts)

WERRET, W. F., A. J. CANDY, J. O. L. KING, and **P. M. SHEPPARD.** 1959. [Messrs. J. Bibby & Sons, Hans Hall Farm, Willaston, Wirral.]

SEMI-ALBINO: A THIRD SEX-LINKED ALLELOMORPH OF SILVER AND GOLD IN THE FOWL. *Nature* [*Lond.*]. 184: 480.—Among the 76,542 progeny of a cross between a Brown Leghorn cock and a Light Sussex hen there occurred, in 1955, 2 chicks that were brown in colour instead of having the expected white (silver) down of

the Light Sussex. When adult, the only one of the pair that was retained was light brown in colour, like a Brown Leghorn pullet.

The results of test matings indicated that the *S* allele had mutated (probably in the Light Sussex dam) to a new sex-linked mutant, s^{al}, resulting in a semi-albino condition in hemizygous ♀♀ and homozygous ♂♂. The mutant chicks were generally small at hatching and grew less rapidly than the other breeds and crosses with which they were reared. The first feathers were white, but with increasing age many birds (especially the cocks) developed a buff tinge on the body feathers. The semi-albinos had difficulty in seeing in dim light and some developed opacities in the eye lenses when adult. There was a high incidence of egg peritonitis in mutant pullets aged between 12 and 14 mths. The semi-albino mutation, s^{al}, is probably the same as one *(al)* reported by Hutt as having occurred in America in Barred Rocks and White Leghorns. (Animal Breeding Abstracts)

WIESE, W. 1958. Schwester- und Tochtergruppen als Auslesemassstab in der Geflugelherdbuchzucht.

SISTER AND DAUGHTER GROUPS AS A MEASURE OF SELECTION FOR THE POULTRY FLOCK REGISTER. *Dtsch. WirtschGeflugelz.*, 10: 150-153; 174-175.—In order to raise the level of egg production in Western Germany new conditions of entry into the poultry flock register were introduced in 1949,, taking into account not only individual records but also those of sister groups. Firstly, an examination was made of the records of the 2 oldest White Leghorn registered flocks in Hanover from 1948-49 to 1955-56. In both flocks, the percentage of sisters fulfilling the requirements for registration showed an upward trend. Secondly, a statistical analysis was made of the records of hens in the Hanover Poultry Flock in 1950-51, when selection by the new method was newly in operation, and in 1955-56, when it had been in operation 7 yrs. From a comparison of both seasons it was shown that not only has the new method brought about an improvement in egg production but also a reduction in variation. (Animal Breeding Abstracts)

WILKINSON, A. D. 1959.

NATIONAL LAYING TEST, 1958-59. *Poult. Ind.*, 24: 469-474; 517-528.—The 61st test [held at Milford, Surrey] as a whole is briefly reviewed by the manager ((pp. 471-472). Winners of trophies and special awards are listed on pp. 469-470. The av. production of the 1236 birds entered was 206.67 eggs. Rhode Island Reds, which had the largest entry, averaged 216.00 eggs, a slight drop on the record figure of the previous year, while Light Sussex averaged 210.63 eggs. Buff Rocks and North Holland Blues set up new records, 214.67 and 219.17 eggs resp. Mortality was 12.06%. A summary of leading pens is given on pp. 473-474. The egg production tables on pp. 517-528 show the final position of each pen and the complete individual records, including egg grades. (Animal Breeding Abstracts)

YAMADA, Y. 1959.

BREEDING STRUCTURE OF POULTRY FLOCK WHICH MAXIMIZES THE GENETIC PROGRESS BY SELECTION. *Rep. nat. Inst. Genet. Jap.* [*Misima, Sizuoka-Ken*], No. 9 (1958): 77-78.—Using selection indices derived by Osborne [*see A.B.A.*, 25, No. 1500], the optimum selection intensities for ♂♂ and ♀♀ in a breeding flock for a given heritability and population size of ♀♀ are calculated. (Animal Breeding Abstracts)

YAMADA, Y. 1959.

EVIDENCE OF SIGNIFICANT INTERACTIONS BETWEEN SIRE FAMILY AND DATE OF HATCHING IN EGG PRODUCTION OF CHICKENS. *Rep. nat. Inst. Genet. Jap.* [*Misima, Sizuoka-Ken*], No. 9 (1958). 80-81.—Data pertaining to 15 sire groups of Barred Plymouth Rocks were used in comparing the influence of 3 different hatching dates (13th Feb. 10th March, 11th March-10th April, and

11th April-29th May). A highly significant interaction was found between sire family and date of hatching for hen-housed egg production to 500 days of age. No significant interaction was found in the case of sexual maturity. (Animal Breeding Abstracts)

YAMADA, Y., and **T. ITO.** 1959.
PERFORMANCE TEST AND SELECTION EFFICIENCY INVOLVING DIFFERENT ENVIRONMENTS. *Rep. nat. Inst. Genet. Jap.* [*Misima, Sizuoka-Ken*], No. 9 (1958): 78-80.—In order to determine the importance of genotype-environment interactions in performance tests of birds of similar genotypes under different environments, a study was made of 3 separate breeding groups of Barred Plymouth Rocks totalling 1580 birds. Under the conditions of the experiment, the variances of interaction in the case of sexual maturity and egg production were both negative, hence the interaction appeared to be unimportant. Variances of station differences in both traits were fairly large but did not greatly affect the efficiency of selection. It is concluded that the testing of family members at several different places is permissable, but that sources of environmental variation should be standardised as far as possible in order to increase the efficiency of selection. (Animal Breeding Abstracts)

YAO, T. S. 1959. [Univ. Nebraska, Lincoln.]
ADDITIVE AND DOMINANCE EFFECTS OF GENES IN EGG PRODUCTION AND 10-WEEK BODY WEIGHT OF CROSSBRED CHICKENS. *Poultry Sci.*, 38: 284-287.—A comparison was made of additive and dominance effects of gene action (dominance effects being due to interaction between allelic genes) on egg production and 10-wk. body weight of diallel crosses between inbred Leghorns and Grays, and of inbred Leghorns. Purebreds of both breeds were used as controls and the inbreds were considered to represent homozygous genotypes. Diallel crossing was used to eliminate epistatic effects. In egg production of the crosses the total dominance effects were higher than the additive, whereas in body weight the reverse was the case, but both dominance and additive effects were highly significant in both traits, signs of overdominance being present in the dominance effects. By confining the experiment to inbred Leghorns only, both traits showed highly significant dominance effects, whereas moderately significant additive effects appeared in egg production but not in body weight. (Animal Breeding Abstracts)

PHYSIOLOGY

ADAMS, J.L. 1959. [Dep. Poult. Husb., Univ. Wisconsin, Madison.]
OBSERVATIONS OF MALE TURKEY MATING BEHAVIOR IN A COMMERCIAL BREEDING FLOCK. *Poult. Sci.*, 38: 743-746.—Observations were made on the mating behaviour of 42 ♂ [Broad Breasted Bronze] turkeys in a large commercial breeding pen of 475 hens. The observation periods were spaced at approx. weekly intervals over March, April and the first 2 wks. of May. Inspection of the performance data indicates that it would have been possible to characterise toms as to breeding activity early in the season. Highly significant correlation coefficients between attempted matings and apparently completed matings, and between attempted or completed matings and the number of ♂ ♂ dominated by a tom were found. Observations on ♂ ♂ early in the breeding season were found to be significantly correlated with subsequent observations, indicating the feasibility of early or pre-season mating tests to distinguish sexually active ♂ ♂. (Animal Breeding Abstracts)

ADAMS, A. W. 1960. [South Dakota Agric. Exp. Sta., Brookings.]
THE EFFECT OF SUBCUTANEOUSLY INJECTED PROGESTERONE ON MOLTING AND SUBSEQUENT EGG PRODUCTION OF CHICKENS. *Proc. S. Dak. Acad. Sci.*, 1959, 38: 116-121.—Single Comb White Leghorn hens that had started to moult or were laying at

a low rate prior to moulting were divided into 4 groups, each consisting of 6 birds. Group 1 (controls) received no progesterone; group 2 received 4 subcutaneous injections of 25 mg. progesterone, 14 days apart; group 3 received 2 injections of 50 mg., 28 days apart; and group 4 received a single injection of 50 mg. progesterone. In a further experiment, 26 hens belonging to a meat-type strain of White Plymouth Rocks were each injected subcutaneously with 50 mg. progesterone; 27 non-treated hens served as controls. All levels of progesterone used were effective in temporarily suppressing egg production and in inducing a more complete moult. Four weeks after the initial injection, all the progesterone-treated birds had ceased laying. Birds receiving more than one injection had not resumed laying 10 wks. after the initial injection. However, by this time White Leghorns given only a single injection were laying at a higher rate than the controls, although similarly treated Plymouth Rocks were laying at a lower rate. (Animal Breeding Abstracts)

ALLEN, T. E. 1958. [Poult. Res. Centre, Werribee, Vict.]
THE STORAGE OF FOWL SEMEN AT LOW TEMPERATURES. *Proc. Aust. Soc. Anim. Prod.*, 1958, 2: 118-119.—Frozen undialysed semen, on thawing, was inseminated directly into the uterus of 41 hens. Of the 128 eggs set, 25% were fertile, but if the 21 completely infertile hens were eliminated, 58% fertility was obtained. Eggs were broken out after 48 hrs. incubation. As the majority of embryos were dead even at this early stage of development, the hatchability of fertile eggs would have been very much lower than the 71% obtained by Polge [*see A.B.A., 20,* No. 899]. It was observed that although the frozen undialysed semen resumed full motility on thawing, there was a rapid decline in motility thereafter. (Animal Breeding Abstracts)

ALEXANDER, P. S. 1959. [Indiana Univ., Bloomington.]
REPRODUCTIVE DEVELOPMENT IN THE WHITE LEGHORN PULLET. *Diss. Abstr.*, 20: 1486. (Animal Breeding Abstracts)

ALVAREZ GONZALEZ, M. 1958. Estudio sobre precocidad sexual intensidad de puesta y correlacion entre distintos caracteres de puesta en dos poblaciones avicolas, una de castellana negra y otra de Leghorn.
A STUDY OF SEXUAL PRECOCITY, INTENSITY OF LAY AND CORRELATIONS BETWEEN CERTAIN LAYING CHARACTERS IN GROUPS OF BLACK CASTILIAN AND LEGHORN POULTRY. *An. Fac. Vet. Leon.* 4(4): 85-104. [French and English summaries.]—There was a clear negative correlation between early maturity and intensity of lay during the 1st laying year in the Black Castilian group and there was no correlation between early mautrity and productivity at the end of the 1st yr. of lay in either group. There was a correlation between the winter and annual production in both groups, and no correlation between production in the 1st and 2nd yrs. In the 2nd yr. egg yield of the Black Castilians and Leghorns was 81% and 71% resp. of that in their 1st yr. (Animal Breeding Abstracts)

ANDERSON, J. E., H. Y. C. WONG, A. C. LEVY, and **A. K. WONG.**
INFLUENCE OF EXERCISE ANDROGEN ADMINISTRATION AND "ATHEROGENIC" DIET ON HEMATOLOGIC CHANGES IN PULLETS. *Proc. Soc. Exp. Biol. Med.*, 1959, 102, 419-421. [Dept. Physiol., Howard Univ. Sch. Med., Washington, D.C.]—Pullets 6 weeks old were given a basal diet alone or with 2 per cent. cholesterol and 5 per cent. cottonseed oil. Some birds on the supplemented diet received injections of testosterone and were, or were not, exercised daily for 1 hr. Testosterone significantly increased red cell counts and haematocrit values and reduced spleen weight, but cholesterol and exercise had no such effect.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

ASAJ, R., A. RAKO, V. STANKOVIC, and **S. KRVAVICA.** Utjecaj nekih faktora na slobodne aminokiseline jetre i krvi. 2. Nesivost jaja.
INFLUENCE OF SOME FACTORS ON FREE AMINO ACIDS

IN LIVER AND BLOOD. 2. EGG-LAYING. *Vet. Arhiv*, 1959, 29, 203-206. [Zavod Patol. Fiziol., Vet. Fak., Sveuc. Zagreb.] English and French summaries.—For part 1 see Abst. 2508, Vol. 30.

2. Two groups of pullets were similarly fed from the age of 3 months and were killed either after 4½ months, before they started to lay, or at the height of laying; mean weights of the ovaries were 0.78 and 5g.; respectively. Free amino acids were estimated microbiologically in liver and blood.

In liver there was no significant difference between laying and non-laying birds in the concentrations of histidine, valine or threonine, but in the laying birds methionine, trytophan and arginine were considerably higher. In blood there was no significant difference in histidine, threonine or arginine; in laying birds methionine and tryptophan were considerably increased and valine to a smaller extent.—*D.* Duncan. (Nutrition Abstracts & Reviews)

BACZKOWSKA, H. 1959. [Zootech, Inst., Cracow.] Przyczyny i znaczenie roznic w wielkosci zarodkow kur i kaczek w pierwszych dwoch dobach wylegania.

CAUSES AND SIGNIFICANCE OF SIZE DIFFERENCES IN FOWL AND DUCK EMBRYOS IN THE FIRST TWO DAYS OF INCUBATION. *Roczn. Nauk rol. B*, 74: 179-197. [Russian and English summaries.]—A study was made of the size and appearance of the blastodiscs of hen eggs incubated for 24 hrs. and of duck eggs incubated for 36-42 hrs. Indistinct embryos were more common in fowl than in duck eggs, and were more numerous in stored than in newly laid eggs. There was no relationship between egg weight and embryo size. Hatchability improved as blastodisc size increased. (Animal Breeding Abstracts)

BARNABAS T., and **K. R. MENON.**

CHANGES IN THE SERUM PROTEIN FRACTIONS OF THE DOMESTIC FOWL (GALLUS DOMESTICUS) DURING MATURITY. *Acta phÿsiol. pharmacol. neerl.*, 1959, 8, 343-348. [Ahmednagur Coll., India.]—Blood from mature fowls of both sexes, chickens and pigeons contained, in total serum protein, albumin 32.3,, 42.4 and 46.7 and globulins α_1, 3.4, 6.0 and 7.4, α_2 9.6, 10.5 and 17.2, β 51.7, 23.2 (β_1 15.7, β_2 7.5) and 25.4 and γ 3.0 (γ_1 1.7, γ_2 1.3), 17.9 (γ_1 8.5, γ_2 9.4) and 3.3 per cent.—A. Hepburn. (Nutrition Abstracts & Reviews)

BECKER, W. A., and **L. R. BERG.**

EFFECT OF GROWTH RATE, HOMOZYGOSITY AND HETEROZYGOSITY OF CHICKENS ON THE SENSITIVITY OF EXPERIMENTS. *Poultry Sci.*, 1959, 38, 1409-1422.[State Coll. Washington, W. Washington Exp. Stat., Puyallup.]—The sensitivitiy of an experiment in which a number of treatments are to be compared is considered to be measured by the value of F, which may roughly be described as the ratio of the variability between results with different treatments to the variability between results with the same treatment. If a number of experiments are made with different techniques to compare the same set of treatments, the one giving the highest F value will be the most sensitive. This concept was applied to the results of a number of trials in which chickens were fed to eight weeks of age on different planes of nutrition. They were weighed at different times ond the logarithm of body weight was chosen as the measurement to be compared. The variance rose to a maximum when the birds were 2 to 4 weeks old and then fell. For birds on a high plane of nutrition the variance was less than for those on low or medium planes, and the maximum was passed at an earlier age. The value of F tended to be higher for rapidly growing strains of birds than for slow growing, at least up to 4 or 5 weeks old, and also was higher for males than for females of the same strain. The heterozygosity or homozygosity of the birds did not influence the F ratio to a great extent, since differences in the denominator tended to be positively correlated with differences in the numerator.

A further set of values of F were calculated, to measure the sensitivity of comparisons between birds of different strains on the

same diet. It was concluded that maximum sensitivity in such tests was attained at a greater age than in tests to compare diets, and that for this purpose birds should be kept for at least 7 or 8 weeks; in such experiments the diet should permit rapid growth.—I. McDonald. (Nutrition Abstracts & Reviews)

BONADONNA, T., and **G. C. POZZI.** 1959 [Ist. Sper. Ital., "L. Spallanzani" Fecond. Artif. Anim., Milan.] Ricerche sulla spermiogenesi del "Gallus gallus" in diverse condizioni di luce e di temperatura ambiente.

RESEARCHES ON SPERMATOGENESIS IN *GALLUS GALLUS* UNDER DIFFERENT LIGHT AND TEMPERATURE CONDITIONS. *Zootec. e Vet.*, 14: 194-208. [English summary.]—Cornish White cocks aged approx. 18 mths. were divided into 3 groups of 5 each. Each group was submitted to different conditions of light: normal light (control), permanent darkness and permanent light over a period of 115 days. Of each group, 3 birds were kept at 20° C. and 2 at 6°-8° C., and in each group except the control, 1 bird from each temperature sub-group received 3.5 units of anterior pituitary hormone each week. Temperature conditions did not appear to have any influence on live weight increase, semen production, or on histological appearance of the testes, thyroid, pituitary or adrenal glands. Permanent light caused a condition of hyper-excitability and higher semen production. Darkness had a reverse effect and semen became practically unobtainable (milking method), with a corresponding regression of germinal epithelium. No marked effect could be attributed to the treatment with pituitary hormone. (Animal Breeding Abstracts)

BORTOLAMI, R., and **A. VEGGETTI.** 1959. [1st. Anat. Norm. Vet., Univ. Bologna.] Aspetti microscopici dell'ipofisi di gallina durante la deposizione.

MICROSCOPICAL STUDIES OF THE PITUITARY OF HENS DURING LAY. *Atti Soc. ital. Sci. vet.*, 1958, 12 (Suppl. to *Arch, vet. ital.*, 9, No. 3): 535-537. [English and German summaries.]—In an investigation of a group of 12 Leghorn hens in various stages of lay, no marked variations of the pituitary could be found which could be correlated with the phase of laying. Only slight variation in follicular structure and colloid content were noted. (Animal Breeding Abstracts)

BOST J., and **G. GOULARD.** 1958. [Ec. Nat. Vet., Toulouse.] Action des fortes doses de benzoate d'oestradiol sur les fonctions germinal et endocrine du testicule du coq.

THE EFFECT OF LARGE DOSES OF OESTRADIOL BENZOATE ON THE GERMINAL AND ENDOCRINE FUNCTIONS OF THE COCK TESTIS. *Ann. Endocr.* [*Paris*], 19: 32-49.—The daily injection of 2.5 mg. benzoate oestradiol to 13 pure White Leghorn cocks caused the comb to regress, reduced testis weight and inhibited spermatogenesis. These effects were reversed when treatment was stopped. (Animal Breeding Abstracts)

BROWN, K. I. 1959. [Dep. Poult. Sci., Ohio Agric. Exp. Sta., Wooster.]

ELECTROLYTE COMPOSITION AND FREEZING POINT DEPRESSION OF TURKEY SEMINAL FLUID. *Poult. Sci.*, 38: 804-806.—Ejaculates collected monthly from Jan. to April from 10 ♂♂ each of the Bronze, Large White, and Small White breeds were examined with a view to gaining information concerning the electrolyte composition and osmotic tension of turkey seminal fluid necessary for the formulation of a satisfactory diluent. (Animal Breeding Abstracts)

BURGER, R. E., N. S. Van MATRE, and **F. W. LORENZ.**

GROWTH AND MORTALITY OF CHICKS AND POULTS FED TRANQUILIZING DRUGS. *Poultry Sci.*, 1959, 38, 508-512. [Dept. Poultry Husb., Univ. California, Davis.]—Chlorpromazine, 125 mg. per kg. feed, given to 4-day-old White Leghorn chickens for up to 24 days, did not depress growth, but at higher levels, up to 8 g. per kg.,

it had a harmful effect, and with 16 g. per kg. all died within 24 days.

Reserpine at 0.5 mg. per kg. significantly improved growth; 1.0 and 2.5 mg. per kg. gave a slight growth response, but 5.0 to 25 mg. had a slight and from 50 to 500 mg. a marked depressing effect, and mortality was 96 per cent. at the highest level. Reserpine mother liquor, a crude Rauwolfia preparation from which 90 per cent. of the reserpine had been extracted, had little effect on growth of chicks to 45 days of age at levels between 0.5 and 25 mg. per kg., but with turkey poults 1.0 mg. per kg. for 38 days significantly improved growth; at 21 days 10 or 25 mg. per kg. depressed growth, but the birds appeared to recover from the effect by 38 days of age.—J. S. Thomson. (Nutrition Abstracts & Reviews)

CACIOPPO, F., F. RUBINO, and **L. PANDOLFO.** Azione della tiroxina sul consumo di O_2 di omogenati di cuore di colombi in avitaminosi B_1.

EFFECT OF THYROXINE ON OXYGEN CONSUMPTION BY HOMOGENATES OF HEART FROM PIGEONS WITH VITAMIN B_1 DEFICIENCY. Azione della tiroxina sul consumo di O_2 di omogenati di cuore di colombi in avitaminosi B_1 in presenza di succinato. EFFECT OF THYROXINE ON OXYGEN CONSUMPTION IN PRESENCE OF SUCCINATE BY HOMOGENATES OF HEART FROM PIGEONS WITH VITAMIN B_1 DEFICIENCY. *Boll. Soc. ital. Biol. sper.*, 1959, 35, 471-472; 473-474. [Ist. Chim. Biol., Univ. of Palermo.]—(a) Of 4 groups each of 5 pigeons, 2 were forcibly fed on polished rice, 30 g. daily, and were killed in early and in terminal stages, respectively, of vitamin B_1 deficiency. The third group were given injections of 1 mg. vitamin B_1 daily and were underfed on polished rice so as to lose about the same amount of weight as the birds of the second group; the fourth group were fed on maize and wheat. Ozygen consumption of homogenates of heart tissue from birds of each group was measured in absence or presence of thyroxine.

Oxygen consumption by homogenates from birds deprived of vitamin B_1 was depressed, but that by homogenates from merely underfed birds was not. Thyroxine stimulated oxygen consumption in all homogenates, but much less in vitamin B_1 deficiency.

(b) Three groups of pigeons corresponded with the first, second and fourth above. Oxygen consumption was measured of homogenates of heart tissue alone, with thyroxine or with thyroxine and succinate. When succinate was present the stimulation of oxygen consumption by thyroxine was almost normal even in tissue of birds deprived of vitamin B_1—D. Duncan. (Nutrition Abstracts & Reviews)

CAMPBELL, R. S. F., G. CHURCH, M. DICK, T. D. V. LAWRIE, R. PIRRIE, and **W. C. WATSON.**

THE EFFECT OF EPI-OESTRADIOL BENZOATE ON CHOLESTEROL INDUCED ATHEROSCLEROSIS IN THE CHICKEN. *Brit. J. Exp. Pathol.*, 1959, 40, 338-342. [Dept. Cardiol., Glasgow Royal Infirmary.]—Cockerels one month old were divided into 6 groups of 12 and were fed on a standard diet with or without 1 per cent. added cholesterol; groups on each diet were treated with 1 or 5 mg. *epi*-oestradiol daily for the last 8 weeks of a 16-week experiment. The aorta and brachiocephalic and iliac arteries were then examined for degrees of atherosclerosis and the heart was sectioned. Only one of the birds given cholesterol had a normal aorta, and two control birds had moderate lesions. Feminising effects were caused by the oestrogen, but no improvement of coronary or aortic lesions was produced. There was a gross increase of β-lipoproteins, cholesterol and phospholipid and the cholesterol : phospholipid ratio fell.—J. E. Hammant. (Nutrition Abstracts & Reviews)

CECETKIN, A. V. Vozrastnaja dinamika soderzanija belka i nukleinovyh kislot v peceni kur raznogo napravlenija produktivnosti.

VARIATIONS WITH AGE IN PROTEIN AND NUCLEIC

ACIDS IN THE LIVER OF HENS OF DIFFERENT TYPES. *Ptitsevodstvo*, 1959, No. 11, 23-26. [Vet. Inst., Kharkov.]—Russian White, New Hampshire and first cross hens were compared. The absolute weight of the liver was greatest in New Hampshires and the relative weight in Russian Whites. Livers were heaviest during the autumn laying period, at age 12 months, and lightest during moulting at 18 months. The protein N content of the liver was highest at 6½ months in Russian Whites, but was higher in the other breed and the cross-bred birds, and the peak in the New Hampshires was reached at 4½ months. In both breeds N.P.N. rose continuously in the first year and fell somewhat during the moult. Variations in phosphoprotein and nucleic acids are tabulated; the ribonucleic acid fraction especially increased during active protein formation in the laying period.—D. Duncan. (Nutrition Abstracts & Reviews)

CLERMONT, Y. 1958. [Dep. Anat., McGill Univ., Montreal.] Structure de l'epithelium seminal et mode de renouvellement des spermatogonies chez le canard.

THE STRUCTURE OF THE SEMINAL EPITHELIUM AND THE MODE OF SPERMATOGONIA RENEWAL IN THE DUCK. *Arch. Anat. micr. Morph. exp.*, 47: 47-66. (Animal Breeding Abstracts)

COHEN, J. 1959. [Med. Res. Coun. Unit Exp. Path. Skin, Univ. Birmingham.]

THE PIGMENT CELL SYSTEM IN THE LIGHT SUSSEX FOWL. *J. Embryol. exp. Morph.*, 7: 361-374. (Animal Breeding Abstracts)

COLES, R. 1959. [Nat. Agric. Adv. Serv., Minist. Agric., London.]

THE INFLUENCE OF LIGHT ON THE GROWTH AND EGG PRODUCTION OF FOWLS. *N.A.A.S. quart. Rev.*, No. 45: 25-31. A review. (Animal Breeding Abstracts)

COMMON, R. H., and C. C. MOK.

PHOSVITIN IN THE SERUM OF THE HEN. *Nature*, 1959, 183, 1811-1812. [Fac. Agric., Macdonald Coll., McGill Univ., Que.]—Phosvitin was found in the phosphoprotein fraction of serum of laying or oestrogen-treated hens, supporting the idea that yolk constituents are synthesised in the liver and transported by the blood.

It is postulated that "PP" lipoprotein fraction, rich in P and found in serum of laying and oestrogen-treated hens, is a lipovitellin-phosvitin-γ-livetin complex.—J. Gordon. (Nutrition Abstracts & Reviews)

CONNER, M. H.

EFFECT OF VARIOUS HORMONE PREPARATIONS AND NUTRITIONAL STRESSES IN CHICKS. *Poultry Sci.*, 1959, 38, 1340-1343. [Animal Husb. Res. Div., Agric. Res. Serv., Beltsville, Md.]—The stresses imposed were complete deprivation of water and limitation of both feed and water.

In the first experiment, lasting 13 days, 5 groups of male chickens 35 days old had access to water and 5 were deprived. In each set 4 groups had injections of ACTH, deoxycorticosterone acetate (DCA), cortisone, or a mixture of ACTH and DCA. ACTH had no effect on adrenal or thyroid weights but markedly increased weight of testes of chickens given water. Cortisone had a similar effect, while DCA alone or with ACTH silghtly increased weight of testes. Water deprivation markedly decreased rate of growth and increased adrenal weight as a percentage of bodywieght and this effect was not altered by the drugs. Weights of thyroid and testes were unaffected by water deprivation but weight of testes was reduced by cortisone when the chickens were deprived of water. In the stressed groups mortality was high, ranging from 20 to 70 per cent.

In the second experiment, with 4-week-old male chickens, a control group received both feed and water to appetite (100/100) while other groups were restricted in either feed or water to the following pro-

portions: 25/100, 50/50, 50/100, 100/25 or 100/50. Apart from the control group, the only group to gain weight over 6 days was that given full feed and half water; greatest loss of weight was with quarter feed and full water. Thyroid size was depressed by the more stringent limitations of feed and water while adrenal size was slightly increased. Size of testes was markedly decreased by all restrictions except in the group receiving full feed and half water. Cloacal temperature was depressed only with quarter feed and full water. Feed restriction had a greater effect than water restriction on growth, adrenal size and cloacal temperature and it is suggested that young birds are able to use metabolic water to counteract water deficiency over a short period. There was no death in this experiment.—J. S. Thomson. (Nutrition Abstracts & Reviews)

COOUER D. M. and **J. G. ROWELL** 1959. [Houghton Poult. Res. Sta. Houghton, Hunts.]
A COMPARISON OF TWO TECHNIQUES FOR INSEMINATING CHICKENS. *Vet. Rec.*, 71: 715-717.—The technique in general use, in which semen is deposited in the upper region of the vagina but posterior to the orifice of the utero-vaginal junction, was compared with a new one which forced the semen into the uterus itself. Fertility was improved by an average of 15.6% using the new technique, which is recommended. In both cases semen volumes were 0.01, 0.03 and 0.05 ml., and fertility tended to decrease as the volume inseminated increased. (Animal Breeding Abstracts)

CRISAN, C., I. MIHALCA, C. TODORUTIU, O. ONEA, E. CARPENSTANESCU, and **C. JOANDREA.** 1958. Marirea vitalitatii prin heterospermie la pasari.
INCREASED VITALITY OF FOWL THROUGH HETEROSPERMY. *Stud. Cercet. Biol.* [*Cluj*], 9(1): 137-140. [Russian and French summaries.] Title in *Biol. Abstr.*, 1960, 35, No. 3329. (Animal Breeding Abstracts)

DANIEL, J. C. (Jr.). 1959. [Adams State Coll. Colorado, Alamosa.]
A CASE OF TWIN EMBRYOS OF THE GUINEA FOWL. *J. Hered.*, 50: 176, 192.—This is possibly the 1st report of twin embryos in the guinea-fowl *(Numida meleagris)*. One twin was an apparently normal 30-hr-old embryo; the other was underdeveloped and showed severe malformations, especially of the neural tube. Evidence is presented which suggests that they were ♂♂ and monozygotic. (Animal Breeding Abstracts)

DAVYDOVA, Z. M. Nekotorye osobennosti v mineralizacii trubcatyh kostej kur v period jajcekladki.
CHARACTER OF MINERALISATION OF LONG BONES OF HENS IN THE LAYING PERIOD. *Izv. Timirjazev. Sel'skohoz. Akad.*, 1959, No. 4, 179-186.—By X-ray studies of many hens and supporting histological examinations it was found that in the laying period bone is laid down in the marrow cavity of long bones, so that the cavity may be almost filled; such deposition was not seen in immature pullets or in cocks. Bone deposition began first in the femur, followed by the tibiotarsus and later by the wing bones. More new bone was deposited in hens with an unlimited mineral supplement than in those with restricted amounts of Ca, and more in poor than in heavy egg-producers. The new bone was more completely mineralised than the compact bone.—D. Duncan. (Nutrition Abstracts & Reviews)

DAYTON, S. (with **K. HOUSKA,** and **M. STELE.**)
TURNOVER OF CHOLESTEROL IN THE ARTERY WALLS OF NORMAL CHICKENS. *Circulation Res.*, 1959, 7, 468-475. [Res. Serv., Veterans Admin. Centre, Univ. California, Los Angeles.] Interlingua summary.—Young adult cockerels maintained on stock diet were given a single dose of cholesterol-4-^{14}C by stomach tube and were

killed in groups of 3 at intervals up to 42 days later. Cholesterol was isolated from plasma, liver, abdominal aorta, thoracic aorta and brachiocephlic arteries, and the amount and its radio-activity were estimated. The specific activity of all artery samples of cholesterol was highest after 8 or 9 days. The rise and subsequent fall of activity in chloseterol was more rapid in the abdominal aorta than in the other arteries studied. The maximum rise of radio-activity in plasma and liver cholesterol occurred within about 2 days, followed by a rapid decrease for about 25 days and then little change. The rate of transfer of cholesterol from plasma to arterial wall seemed to be least in the abdominal aorta, which has the thinnest wall.—A. M. Copping. (Nutrition Abstracts & Reviews)

DEVINSKY, F. Vplyv Dubosolu na liahnivost nasadovych vajec a na zivotnost potomstva.
THE EFFECT OF DUBOSOL ON HATCHABILITY AND VIABILITY OF OFFSPRING. *Pol'nohospodarstvo*, 1959, 6, 567-582. [Tech. Agric. Sch., Bernolakovo, Czechoslovakia.] English, German and Russian summaries.—Dubosol (see Abst. 1572, Vol. 28), 2 g. per kg. feed, added to the ration before the beginning of the production period gave 78 to 89 per cent. hatchability of all eggs set. The offspring of hens given Dubosol were healthy and resistant to disease, their weight gains were higher and their mortality lower than in the control groups not given Dubosol.—A. Jancarik (Czechoslovakia). (Nutrition Abstracts & Reviews)

DRYE, K. J., J. C. GILBREATH, and **R. D. MORRISON.**
THE EFFECTS OF RESERPINE ON CHICKEN MALES ON RANGE. *Poultry Sci.*, 1959, 38, 781-786. [Poultry Sci. Dept., Oklahoma State Univ., Agric. Exp. Stat., Stillwater.]—In 3 experiments reserpine, from 1 to 25 mg. per lb. feed, was given to groups of adult male New Hampshires or White Leghorns. Even at the highest level, which supplied about 3 mg. per bird per day, there was no effect on growth, feed consumption or mortality, and no visible sign of sedation. Breed differences were found in growth rate and feed efficiency.—J. S. Thomson. (Nutrition Abstracts & Reviews)

EDWARDS, H. M. (Jr.), and **M. B. GILLIS.**
A CHROMIC OXIDE BALANCE METHOD FOR DETERMINING PHOSPHATE AVAILABILITY. *Poultry Sci.*, 1959, 38, 569-574. [Gen. Res. Lab., Internat. Minerals and Chem. Corp., Skokie, Ill.]—A method is described which avoids slaughtering experimental animals. It is recommended for use when a rapid approximate estimation of availabilty is required. By this method it was found that chickens which had previously been offered a diet deficient in P subsequently retained P more efficiently than chickens which had had enough P. The biological values for chickens of phosphatic supplements were tested by this method and reasonably good agreement with existing methods was obtained. With rats 6 supplements were tested and the results were checked by comparison with figures obtained from the same rats by the bone-ash method. This showed that the chromic oxide method is accurate.—J. G. Gordon. (Nutrition Abstracts & Reviews)

EL ZAYAT, S., A. VAN TIENHOVEN, and **B. AMIDON.** 1960. [New York State Agric. Exp. Sta., Ithaca.]
THE EFFECTS OF N-BISDEHYDRODOISYNOLIC ACID AND OF PROGESTERONE ADMINISTERED BEFORE INCUBATION ON THE GONADS OF THE CHICK. *Tijdschr. Diergeneesk.*, 85: 18-22. (Dutch, French and German summaries.)—Egg hatchability and gonad differentiation were studied in fertile Rhode Island Red × Barred Plymouth Rock eggs that were subjected, 3 hrs. before incubation, to no treatment or to one of the following treatments: injection into the air cell of 0.133 mg. Na salt of N-bisdehydrodoisynolic acid (an oestrogenic substance) + 300 units pencillin in 0.1 $cm.^3$ water; injection into

the air cell of 0.1 cm.^{3} water containing 300 units penicillin; dipping for 5-8 secs. in oil emulsion; or dipping for 5-8 secs. in oil emulsion containing 10 mg. progesterone per 100 ml. The hatchablity of water- and oestrogen-injected eggs was higher than that of untreated eggs, the difference between untreated and oestrogen-injected eggs being significant. Dipping in oil reduced hatchabilty. Progesterone treatment retarded development and caused delay in hatching but appeared to have no effect on gonad differentiation. Oestrogen treatment did not affect the ♀ left gonad, but it caused ovotestis development of the left (but not the right) gonad of genetic ♂ ♂. There was an increased incidence of cystic oviducts in oestrogen-treated chicks of both sexes. (Animal Breeding Abstracts)

FEDOROVSKIJ, N. P., and **V. I. KONOPLEVA.** Fiziologija zeludocnogo piscevarenija u gusej.

PHSIOLOGY OF GASTRIC DIGESTION IN THE GOOSE. *Ptice-vodstvo*, 1959, No. 10, 39-44.—Pavlov fistulae were made in the stomachs of 9 geese 2 to 3 years old; they were able to live with intact geese and were equal to them in weight and egg production.

Gastric contents were collected once in 10 days for 30 min. before and 90 min. after a test meal of 50 g. food and 25 ml. water. Gastric motility was studied with balloon and kymograph; the balloon was inserted into the gizzard. Some of the geese were on all-plant rations, others received some animal protein in alternate 10-day periods with all-plant rations.

In the periods before feeding, after fasting for 22 hr., gastric juice was always secreted; in 30 min. the mean volume, depending on type of diet, varied from 18.2 to 30.5 ml., with *p*H from 2.16 to 3.22. The volume was lowest in geese at pasture, and proteolytic activity also was low in them. A feed of green clover stimulated the greatest output of secretion, with meat-and-bone meal, mixed concentrates and oats in descending order. After the same 4 feeds the mean *p*H was 3.52, 4.21, 4.70 and 1.71; there was far more free acid after oats than after other feeds. Mixed concentrates evoked the greatest proteolytic activity. Amylolytic activity was greatest after clover and was absent after oats.

Contractions of the gizzard were always present, both fasting and after feeding. Their frequency increased during feeding on concentrates, but little with clover.—D. Duncan. (Nutrition Abstracts & Reviews)

FEIGENBAUM, A. S., and **H. FISHER.**

THE INFLUENCE OF DIETARY FAT ON THE INCORPORATION OF FATTY ACIDS INTO BODY AND EGG FAT OF THE HEN. *Arch. Bio-chem. Biophys.*, 1959, 79, 302-306. [Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.]—Leghorn hens were given a fat-free diet for 2 weeks, after which 5 groups were given supplements of 10 per cent., coconut, cod liver, cottonseed, olive or safflower oil for 5 weeks. A control group continued on the fat-free diet. Eggs collected at the beginning and end of the period and body fat samples taken by biopsy at the same times were studied.

The degree of unsaturation of body fat increased or decreased according to the composition of the fat in the diet, but egg fat was influenced only by the unsaturated fats. Egg fat appeared to derive polyethenoid fatty acids either directly from the diet or by synthesis in ovarian tissue when the diet contained these acids, and from body fat when it did not.—A. K. Lough (Nutrition Abstracts & Reviews)

FERRARA, B., and **G. V. PELAGALLI.** Fegato ed acido orotico. Ricerche istologiche nel pollo domestico.

LIVER AND OROTIC ACID. HISTOLOGICAL STUDIES ON THE DOMESTIC FOWL. *Zootec. Vet.*, 1958, 13, 344-347. (1st Anat. Normale Vet., Univ. Naples.) English summary.—Four groups of chickens 15 days old received a balanced ration alone or with 50, 150 or 3600 mg. orotic acid per kg. diet. All the birds appeared healthy during the feeding period and were killed at 79 days of age. The livers of

birds which had had the smaller amounts of orotic acid were histologically normal. In birds which had had the largest amount there were histlogical changes including some areas of slight degeneration and areas of lipid infiltration around centrolobular vessels. (Numbered references to other work are made, but there is no bibliography.)—D. Duncan. (Nutrition Abstracts & Reviews)

FISHER, H., A. FEIGENBAUM, G. A. LEVEILLE, H. S. WEISS, and **P. GRIMINGER.**

BIOCHEMICAL OBSERVATIONS ON AORTAS OF CHICKENS. EFFECT OF DIFFERENT FATS AND VARYING LEVELS OF PROTEIN, FAT AND CHOLESTEROL. *J. Nutrition*, 1959, 69, 163-171. (Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.)—Day-old cockerels were given for 10 weeks diets of different protein, fat and cholesterol contents. The aortae were scored visually and cholesterol, polyunsaturated faty acids and hydroxyproline were estimated. Plasma cholesterol and fatty acids were estimated also. In a second experiment the effect on hens, 8 and 20 months old, of diets containing fats of different saturation, without added cholesterol, was studied.

In the chickens diets low in protein, 8 per cent., and in cholesterol, 0.3 per cent., induced higher levels of cholesterol in plasma and aorta but less severe atherosclerosis than did diets containing 20 per cent. protein and 2 per cent. cholesterol. In both experiments the abdominal aorta consistently showed more severe lesions than the thoracic aorta and its increase in hydroxyproline content with age was greater. On low-protein diets the amount of aorta fat was greater and its iodine number was lower than on high-protein diets. Whatever the degree of saturation of the food fat, the fat of the abdominal aorta was more saturated than that of the thoracic region, but neither contained unsaturated fatty acids beyond tetraenoic acids. Plasma fatty acids contained significant amounts of penta- and hexaenoic acids. In hens, tallow hastened the development of aortic lesions.—E. M. Cruickshank (Nutrition Abstracts & Reviews)

FOMIN, A. I. and **I. L. GALJPERN.** 1959. [Pushkin Res. Lab. Livestock Breed., Leningrad.] Povysenie ziznennosti i produktivnosti kur obscepoljzovateljnyh porod putem posmennogo sparivanija ih s petuhami svoei i drugoi porody.

INCREASING THE VITALITY AND PRODUCTION OF HENS OF DUAL-PURPOSE BREEDS BY ALTERNATE MATINGS WITH COCKS OF THEIR OWN AND OF ANOTHER BREED. *Pticevodstvo*, 9(9): 32-35.—In 1955-58 at the Alder Hatchery and Pacelma Poultry Farm in Penza Province, Australorp, Pervomai or Rhode Island Red× New Hampshire crossbred hens were mated with cocks of their own breed alternating every 1-7 days with Russian White or Russian White×Leghorn crossbred cocks; hens mated with cocks of their own breed served as controls. Hatchability and chick survival to 2 mths. were greater in the experimental than in the control groups. When Australorp hens had been kept with Russian White cocks and were then put for 25 days with Australorp cocks, 67.4-82.7% of the chicks hatched from eggs laid in the first 5 days were crossbreds and then the percentage of purebreds increased to 100% by the 25th day. The vitality of these purebred chicks was greater than that of purebred controls whose dams were kept only with cocks of their own breed. (Animal Breeding Abstracts)

FRASER, R. C.

SOMITE GENESIS IN THE CHICK. 2. ANALYSIS OF NUTRIENTS FROM YOLK. *Biol. Bull.*, 1959, 116, 420-428. [Dept. Zool. Entomol., Univ. Tennessee, Knoxville.]—Part 1 was in *Growth*, 1957, 21, 29.

2. Chick blastoderms were able to grow normally on medium containing a dialysate of egg yolk and in 24 hr. developed as many somites as chicks grown on whole yolk. The residue of large molecules after dialysis did not support formation of somites, but some development took

place when the large molecules were hydrolysed with acid and glucose was added. The barium-soluble, alcohol-insoluble fraction of yolk or of albumin, believed to include phosphorylated carbohydrate intermediates, gave limited development, but not when the fractions were boiled.—D. Duncan. (Nutrition Abstracts & Reviews)

FRITZ, J. C., F. D. WHARTON, (Jr.) and **L. J. CLASSEN.** EXPERIMENTS WITH TRANQUILIZERS AND SEDATIVES IN BROILER PRODUCTION. *Poultry Sci.*, 1959, 38, 1474-1475. (Dawe's Laboratories, Ins. Chicago, Ill.)—The tranquilisers and sedatives tested for their effect on growth of broilers on a high-energy ration were benactyzine, sodium bromide, reserpine, carbromal and butabarbital sodium.

Amounts of benactyzine up to 8.8 p.p.m. had no effect but a level of 17.6 p.p.m. and above depressed growth. Reserpine, 2.23 p.p.m., significantly improved growth. Carbromal, 2.23 or 22.3 p.p.m., and butabarbital sodium, 0.55 or 5.5 p.p.m., had no effect on growth. Sodium bromide at a level of 0.05 or 0.1 per cent. gave a significant growth response but growth was depressed at higher levels. High levels of the drugs adversely affected efficiency of feed conversion.—J. S. Thomson. (Nutrition Abstracts & Reviews)

GARREN, H. W.
AN IMPROVED METHOD FOR OBTAINING BLOOD FROM CHICKENS. *Poultry Sci.*, 1959, 38, 916-918. [Dept. Poultry Sci., N. Carolina State Coll., Raleigh.]—Blood is drawn directly into a collecting tube, under negative pressure. The method is claimed to be particularly useful when large numbers of samples have to be collected; there is less difficulty with clotting, mortality of birds from heart bleeding is less and the hands of the operator are free to restrain movement of the bird. A method for cleaning the apparatus is described.—J. S. Thomson. (Nutrition Abstracts & Reviews)

GILBREATH, J. C., L. F. GARVIN, and **Q. B. WELCH.**
EFFECT OF ORALLY ADMINISTERED RESERPINE ON EGG PRODUCTION AND QUALITY. *Poultry Sci.*, 1959, 38, 535-538. [Poultry Sci. Dept., Oklahoma Agric. Exp. Stat., Stillwater.]—Pullets 7 months old were given an all-mash breeder ration with or without 2 mg. reserpine per kg. Over the laying period of 196 days during which the temperature ranged from 72° to 95° F. egg production was slightly higher without reserpine but slightly more feed was consumed; bodyweight gain was also higher, but not significantly so. Egg weight was slightly higher in the group receiving the drug, as was shell thickness. Egg quality as measured in Haugh units was similar in both groups. There was no evidence of sedation in the group receiving the tranquilliser, normal conflicts occurring in both groups.—J. S. Thomson. (Nutrition Abstracts & Reviews)

GLEICHAUF, R. 1959. (BundesforschAnst. Kleintierz., Celle.) Bericht uber einen Hormonfutterungsversuch mit Triphenylbromathylen.
REPORT ON A HORMONE FEEDING TRIAL WITH TRIPHENYLETHYLENE BROMIDE. *Arch Geflugelk.*, 23: 101-107. (English summary.)—A pilot experiment was made on the addition of 8 g. triphenylethylene bromide (a synthetic oestrogen) per 100 kg. of feed given to 18 White Leghorn hens from 11th Jan. to 30th June 1957. A similar number served as controls. During this period the experimental birds laid 1883 eggs *v.* 1452 for the controls, av. egg weight being the same for both groups. These results justify a repetition of the experiment on a larger scale. (Animal Breeding Abstracts)

GLICK, B., J. GRIFFIN, and **A. VAN TIENHOVEN.** 1959. (Mississippi Agric. Exp. Sta., State College.)
THE EFFECT OF ENVIRONMENT ON REPRODUCTIVE CHARACTERS AND ENDOCRINE ORGANS OF NEW HAMPSHIRE CHICKENS. *Poult. Sci.*, 38: 1078-1087.—During 3 seasons a comparison

was made between meat-type New Hampshire pullets in a conventional house where the mean high temperature averaged about 76°-86° F. and others in an insulated house (mean high temp. 70°-72° F.) as regards egg production, fertility, hatchability, egg weight, specific gravity and tissue weights. During the 3rd season a group in an open house was added. The analysis was based on the period Feb. to May and May to Aug. Egg production and fertility were slightly higher in the insulated house than in the conventional house. Temperature control had no effect on hatchability of fertile eggs or age of embryonic mortality but favourably affected egg weight and sp. gr. during May-Aug. In 1957, ♂♂ in the insulated house had 6-7% more tubules containing spermatozoa than in the other environments. (Anmial Breeding Abstracts)

GLUCHOWSKI, W. 1959. (Dep. Gen. Anim. Breed., Agric, Coll.. Lublin.) Porownanie wplywu kaplonienia chirurgicznego i wplywu dlugotrwalego stosowania estrogenic na budowe histolgiczna przysadek mozgowych, tarczyc i jader u kogutow.

A COMPARATIVE STUDY ON THE INFLUENCE EXERTED BY SURGICAL CAPONISATION AND PROLONGED TREATMENT WITH OESTROGEN ON THE HISTOLOGICAL STRUCTURE OF THE PITUITARY GLANDS, THYROIDS AND TESTES IN COCKS. *Ann. Univ. M. Curie-Sklodowska, E*, 12 (1957): 459-488. (Russian and English summaries.)—In order to confirm the results obtained in a previous experiment, in which hypermasculinisation of Greenleg cocks was induced by long-continued treatment with stilboestrol, a study was made of the pituitaries, thyroids and testes of ten 18-mth-old cocks that had been subjected for 15 mths. to treatment with silboestrol, and of similar organs in untreated controls and in surgically castrated capons. In the testes of oestrogen-treated birds the primary spermatocytes were 28.5% more numerous than in the controls (indicating an impairment in reduction division), the weight of the testes was greater, and their endocrine function appeared to be enhanced. The thyroid showed hypertrophy and was more active than in the other groups, and the pituitary contained a larger number of eosinophils. (Animal Breeding Abstracts)

GREB, R. J. 1960. (South Dakota State Coll., Brookings.

THE PROBLEM OF THE DEVELOPMENT OF OVIDUCTS IN BIRDS. (Abstr.) *Proc. S. Dak. Acad. Sci.*, 1959 38: 160.—In a line of Rhode Island Reds recently developed at South Dakota State College 90% of the ♀♀ had persistent right Mullerian ducts varying in length from about ¼ normal length to complete ducts. Where some portion of the right oviduct developed, it was always the caudal or cloacal end. (Animal Breeding Abstracts)

GROMOV, A. M. 1959. Izmenenija u kur, voznikajuscie pod vlijaniem perelivanija cuzerodnoi krovi.

CHANGES INDUCED IN HENS BY THE TRANSFER OF FOREIGN BLOOD. *Pticevodstvo* 9 (11): 26-27.—In 1953 blood from Australorps, Bronze turkeys and guinea-fowls was administered parenterally to White Leghorns. The weight and shell colour of the eggs of donors and recipients were not affected. When treatment was given to one or both parents, chicks were produced with dark pigment on the legs and beak; compared with White Leghorns they had greater body weight, a longer body and differences in plumage. The plumage of 1 recipient hen was black after 12 injections of Australorp ♂ blood. Changes were most marked when guinea-fowl blood was given.

In subsequent years blood from the same donor was administered to the first 4 generations of the progeny of the original recipients. Pathological phenomena did not occur in 5th generation chicks on account of their biological affinity to the donors. (Anmal Breeding Abstracts)

HAWKE, J. C.

THE FATTY ACIDS OF PHOSPHATIDYL-ETHANOLAMINE AND PHOSPHATIDYLCHOLINE FROM HEN'S EGGS. *Biochem. J.*, 1959, 71, 588-592. [Fats Res. Lab., D.S.I.R., Wellington, N.Z.]—The fatty acid composition of phosphatidylethanolamine was found to be:

saturated C_{14} 0.4, C_{16} 19.8, and C_{18} 39.5, unsaturated C_{16} 1.2, C_{18} 20.1, C_{20} 9.0 and C_{22} 10.0 per cent. and of phosphatidylcholine : saturated C_{14} 0.2, C_{16} 28.1, and C_{18} 14.2, unsaturated C_{16} 4.4, C_{18} 44.7, C_{20} 4.7, and C_{22} 3.7 per cent. About one-third of the fatty acids esterified in the α-position of phosphatidylethanolamine are estimated to be saturated.—A. K. Lough (Nutrition Abstracts & Reviews)

HOJMAN, D., A. A. PELLEGRINO-IRALDI, M. R. MALINOW, R. PICK, J. STAMLER, and **L. N. KATZ.**
ON AORTIC AND CORONARY ATHEROSCLEROSIS IN CHOLESTEROL-FED COCKERELS: HISTOCHEMICAL EFFECTS OF ESTROGENS. *Arch Pathol.*, 1959, 68, 533-538. (Hosp. Ramos Mejia, Buenos Aires.) (Nutrition Abstracts & Reviews)

HUNTSMAN, C. M., F. N. JEROME, and **E. S. SNYDER.** 1959. (Poult. Dep., Ontario Agric. Coll., Guelph.)
THE RELATIONSHIP BETWEEN PLUMAGE COLOR PHENOTYPES AND THE PRESENCE OF BLACK MELANIN IN THE ABDOMEN OF BROILER CHICKENS: STUDY I. *Poult. Sci.*, 38: 878-881.—This study was undertaken because of a high incidence of melanin deposits in the abdomens of eviscerated fowls in a flock of small roasters which carried the Delaware pattern and were of the genotypes *eeBBSS* and *eeB-S-*. These deposits often have a putrefactive appearance and are objected to by potential buyers. A considerable number of green shanks also occurred and both characters were more prevalent in ♀♀ than in ♂♂. This led to the consideration that the deposition of melanin in the abdomen could be associated with the sex-linked gene *id*.

Two lines were developed, one for the presence of abdominal melanin and the other for its absence. Prevalence and degree of abdominal melanin deposition were examined in relation to the sexes, shank colour and plumage colour phenotype. Further test matings were made between a strain of Columbian Rocks and a strain of Barred Rocks. Both sets of data indicated that the *EB* (extended black, barring) phenotypes are the most free of pigment deposition in the abdomen and that abdominal melanin occurs more frequently in ♀♀ than in ♂♂, thus confirming the findings of Jaap *(see A.B.A.*, 26, No. 2165).

It seems likely that a number of the associations between shank colour and incidence of abdominal pigment are caused by certain combinations of plumage colour genes. In one set of data, no indication was found that there is an association between the presence of the gene *id* and the deposition of melanin in the abdomen. There is a high interaction between sex and the *eB* and *eb* phenotypes as judged by the incidence of abodminal pigment, but a greatly reduced one between sex and either the *EB* or *Eb* phenotypes. Hypothetical crosses are arranged to show that in some crosses abdominal melanin will exhibit sex-linked inheritance while in others it will behave in a sex-limited fashion. (Animal Breeding Abstracts)

INFANTE, R., C. M. CALDARERA, and **A. M. SECHI.** RNA e DNA nel fegato del pulcino in carenza di vitamina B_{12}.
RNA AND NA IN THE LIVER OF CHICKENS DEPRIVED OF VITAMIN B_{12}. *Boll. Soc. ital. Biol. sper.*, 1959, 35, 1213-1215. (Ist. Chim. Biol., Univ. Bologna.)—The basal diet given to chickens from hatching was of soya bean 350, whole maizemeal 375, glucose 10, wheat germ oil 5, lard 200, salt mixture 60, riboflavin 8, vitamin D_3 0.02 g. and 2-methyl-1 : 4-naphthoquinone 1 mg. One group of 6 birds continued on that diet; the other groups received from 5 days of age 10 μg. vitamin B_{12} per 100 g. diet. After about 4 weeks the chickens were killed and nucleic acids in liver were estimated. There was no difference in deoxyribonucleic acid content of fresh tissue, but ribonucleic acid content was about 30 percent. higher in the chickens given vtamn B_{12}—D. Duncan. (Nutrtion Abstracts & Reviews)

IVANOV, V. G. 1955.
EMERGENCE OF DIFFERENTIAL SEX SENSITIVITY IN HEN ONTOGENEISIS. *Ucen. Zap. leningr. gos. ped. Univ.*, No. 110: 67-74.

From abstract in *Biol. Abstr.*, 1960, 35, No. 10596.—An examination was made of fowl embryos that died between the 9th and the 21st day of incubation. At 9-11 days of incubation ♂ and ♀ embryos died in approx equal proportions. At 12-18 days, the mortality of ♂ ♂ exceeded that of ♀ ♀ by 20.4-26.4%, but at 19-21 days 17.8% more ♀ ♀ died than ♂ ♂. All the differences were statistically signficant. Damaged ♀ embryos survived longer than did damaged ♂ ♂. (Animal Breeding Abstracts)

JEROME, F. N., and **C. M. HUNTSMAN.** 1959. (Poult. Dep., Ontario Agric. Coll., Guelph.)

A GYNANDROMORPH WHICH AROSE FROM A SEX-LINKED CROSS. *Poult. Sci.*, 38: 727-731.—This is the first known report of a gynandromorph arising from a sex-linked cross (New Hampshire ♂ × Barred Rock ♀) which carries the ♂ crossbred pattern on the right side and the ♀ crossbred pattern on the left side. Of the 3 reasonable hypotheses which have been advanced to explain such a phenomenon, 2 have a possible application to this bird. These are that it arose from (1) a chromosome or partial chromosome loss very shortly after the 1st cleavage division or (2) non-disjunction at the 1st cleavage division. The genetic implications of both are discussed. (Animal Breeding Abstracts)

JOHNSON, D. (Jr.), A. L. MEHRING, (Jr.), and **H. W. TITUS.**

VARIABILITY OF THE BLOOD PLASMA CHOLESTEROL OF LAYING CHICKENS. *Poultry Sci.*, 1959, 38, 1109-1113. (Lime Crest Res. Lab., Limestone Products Corp. America, Newton, N.J.)—Six groups of pullets on the point of laying were fed in cages on diets of equal protein and energy content but with fat from 3.64 to 14.50 per cent. at the expense of cerelose. The metabolisable energy value was 1420 Cal. per lb. Other groups were maintained on range on feed containing no added fat, energy value 1357 Cal. per lb. After 10 months cholesterol was estimated in plasma.

With caged birds on diets containing added fat there appeared to be a tendency for blood cholesterol to rise, from 196 to 241 mg. per 100 ml., as fat in the diet rose from 3.64 to 10.16 per cent. At higher fat levels blood cholesterol fell, and statistically there was no significant difference. With birds on range, without extra fat, blood cholesterol was from 172 to 232 mg. per 100 ml. and there was no significant difference from values in caged birds given added fat. The coefficient of variation was 29.5 per cent.—J. S. Thomson. (Nutrition Abstracts & Reviews)

KAMAR, G. A. R. 1959. (Anim. Prod. Dep., Univ. Cairo.)

DEVELOPMENTAL CHANGES IN THE REPRODUCTIVE ORGANS OF THE MALE FAYOMI FOWL. *Poult. Sci.*, 38: 775-781.—Thirty-nine Fayomi ♂ ♂ of 13 age groups, from 4 to 52 wks. of age with 4-wk. intervals, were dissected. Weights and measurements of the reproductive organs and secondary sex characters were recorded. Three phases were observed in the normal development of the reproductive organs, the 1st of slight increase during the first 12 wks., the 2nd of rapid increase during the 16th to the 24th wk., and the 3rd of no signficant increase during the rest of the year.—Author's summary. (Animal Breeding Abstracts)

KAMAR, G. A. R. 1960. (Anim. Prod. Dep., Univ. Cairo.)

STUDIES ON FOWL SPERM. I. VIABILITY OF FOWL SPERMS AFTER STORAGE. II. SEASONAL VARIATION IN SPERM ABNORMALITIES. *Emp. J. exp. Agric.*, 28: 16-22.—Semen was collected from 18 one-yr-old Fayoumi cocks at 15-day intervals for 1 yr. Percentage live spermatozoa declined slightly after storage of undiluted semen or 72 hrs. at 4° C., the decline being greater in summer than in winter. The percentages of different forms of sperm abnormalities varied with the season, there being more head malformations in winter and more tail deformities during the summer, due possibly to the intense light and temperature shocks to which semen is subjected during collection. (Animal Breeding Abstracts)

KAMAR, G. A. R., and **A. L. BADRELDIN.** 1959. [Anim. Prod. Dep., Univ. Cairo.]
SEASONAL VARIATIONS IN SEMEN CHARACTERISTICS OF ADULT FAYOMI COCKS. *Poultry Sci.*, 38: 301-315.—As with other breeds of domestic fowl, the Egyptian Fayomi does not have any restricted breeding season. Semen samples from Fayomi cocks, kept under natural conditions at Giza (30° N.), were tested periodically throughout 1 yr. All semen characteristics showed monthly and seasonal variations. Semen quality (motility, viability, and percentage of morphologically abnormal spermatozoa) was best from Dec. to Jan. and poorest from May to Aug. As to quantity (volume of ejaculates, sperm concentration, and cell number irrespective of the quality of individual cells), maxima were recorded from June to Aug., minima from Dec. to Jan. There were highly significant positive correlations between some favourable traits enumerated above in both the qualitative and quantitative groups. (Animal Breeding Abstracts)

KAN, J., B. D. MANASCO, N. R. GYLES, and **R. M. SMITH.** 1959.
THE EFFECT OF COMB-TYPE GENOTYPES ON SIX METRIC TRAITS IN A POPULATION OF MEAT-TYPE CHICKENS. *Poult. Sci.*, 38: 826-828.—A population, consisting of ¾ White Wyandotte and ¼ White Cornish, known as U-Ark was established at the Arkansas Station in 1952. In 1957, a study was undertaken to determine the possible influence of segregating genotypes at one gene locus on 6 metric traits. At this locus the gene *P* determines pea-comb which is dominant to its allele *p* for single-comb. A total of 386 pullets, 135 sigle-combed and 251 pea-combed, was used. The traits studied were: (1) 6-wk. body weight, (2) housing body weight at 7 mths. of age, (3) number of eggs set during the first 16 wks. of production, (4) number of eggs laid during the first 6 mths. of production, (5) per cent fertile eggs set, and (6) percentage hatchability of fertile eggs. None of the traits showed significant differences between the 2 comb types. However, housing weight approached the 5% level of significance, and when variation due to dam differences was removed, single-combed birds were significantly heavier than pea-combed birds at 7 mths. of age. In fact a consistent trend favoured single-combed birds in 5 out of the 6 traits studied. Combined comb and wattle size was related to 5 of the 6 traits for each comb type. Size of the comb and wattle was not related to the first 16 wks. of egg production. However, 6-wk. body weight, housing weight, and fertility were all significantly correlated with comb and wattle size for the pea-comb bird. The possibility is considered that some substances, possibly androgens, in the pullets which are responsibile for variations in comb and wattle size, also stimulate growth to 6 wks. and 7 mths. of age. (Animal Breeding Abstracts)

KEENE, J. H., B. A. TOWER, and **A. B. WATTS.** 1959. (Louisiana State Univ., Baton Rouge.)
A DETERMINATION OF THE IMMEDIATE EFFECTS OF DEBEAKING DAY OLD BROILER TYPE CHICKENS. *Poult. Sci.*, 38: 738.—Twenty-five day-old Vantress-New Hampshire ♀ chicks were debeaked by removing approx. ⅓ of the premaxilla and mandible. A similar number served as controls. The mean daily weight gain of the 2 groups was compared for 10 days and also the total mean weight gain. There were no adverse effects from 1 to 10 days of age due to debeaking (Animal Breeding Abstracts)

KONDO, K. 1959. (Univ. Connecticut, Storrs.)
BREED DIFFERENCES IN THE RESPONSE OF THE MALE REPRODUCTIVE ORGANS OF CHICKEN EMBRYOS TO ESTROGEN. *J. exp. Zool.*, 141: 1-14.—Fertile eggs of 3 breeds, Black Minorca (612 eggs), White Leghorn (275), and New Hampshire (319), were each given a single injection of 500 I.U. oestradiol benzoate into the yolk sac between 0 and 7 days of incubation. The embryos were examined after 18 days of incubation. The reproductive organs of the ♀ embryos appeared to be unaffected by oestrogen treatment. As judged by the

incidence of all degrees of sexual modification, ♂ Black Minorca embryos were the most sensitive to oestrogen treatment, while ♂ New Hampshires were the least sensitive. The Black Minorcas showed the most extreme modifications, and treatment was effective over a longer period of time than in the 2 other breeds. There appeared to be a slight breed difference in the developmental stage at which maximum response occurred (4 days in the New Hampshire, 5 days in the Leghorn and 4 or 5 days in the Black Minorca). (Animal Breeding Abstracts)

KOPYLOVSKAJA, G. Ja. 1958. Produktivnostj kur v zavisimosti ot srokov vyluplenija.
PRODUCTION OF THE FOWL IN RELATION TO TIME OF HATCHING. *Trud. Inst. Genet. (Mosk.)*, No. 24: 366-371.—Experments carried out by Kusner and Veicman in 1947 and 1948 *(see A.B.A.*, 19, No. 1421) were repeated in 1949, 1950, 1953 and 1954. Although chicks hatching on or before the 21st day of incubation tended to come from smaller eggs than those hatching later, it is concluded that time of hatching is not always related to the weight of the egg from which it hatched; breeds laying small eggs do not hatch earlier than those laying large eggs. In each year the first year's production of pullets with a shorter incubation period was greater than that of those pullets with a longer incubation period, and in all the years except 1949 their egg weight was greater. (Animal Breeding Abstracts)

KORNFELD, W. 1960. (Sch. Vet. Med., Univ. Georgia, Athens.)
EXPERIMENTALLY INDUCED PROLIFERATION OF THE RUDIMENTARY GONAD OF AN INTACT DOMESTIC FOWL. *Nature (Lond.)*, 185:320.—Proliferation of the right gonad (which normally ceases growth about the 9th day of incubation) was induced in intact White Leghorn ♀♀ by subcutaneous injections of 17α-ethyl-19-nortestosterone ("Nilevar") in oil starting at 60 days of age. Evidence was obtained that the proliferation was due to the anti-oestrogenic effect of "Nilevar". (Animal Breeding Abstracts)

KOWALEWSKI, K.
UPTAKE OF RADIOSULPHATE BY MUCOPOLYSACCHARIDES OF AORTA IN CHOLESTEROL FED COCKERELS. *Proc. Soc. Exp. Biol. Med.*, 1959, 101, 536-538. (McEachern Cancer Res. Lab., Univ. Alberta, Edmonton.)—Cockerels 2 weeks old were fed for 8 weeks on a stock diet alone or with cholesterol 2 and cottonseed oil 5 per cent. An aqueous solution of $Na_2{}^{35}SO_4$ was injected subcutaneously 24 hr. before the birds were killed; serum and livers were obtained for estimation of lipids and aortae and femora for study of radio-activity. In the birds given the enriched diet there was no significant uptake of ^{35}S by bone, but a significant increase in uptake of ^{35}S by the mucopolysacchardes of the aorta. Serum and liver lipids and the total cholesterol: phospholipid ratio were significantly higher than in birds given the stock diet alone.—G. F. Garton. (Nutrition Abstracts & Reviews)

KUROYANAGI, T.
EFFECT OF ESTROGEN ON ATHEROSCLEROTIC LESIONS IN VARIOUS ARTERIAL SEGMENTS OF CHOLESTEROL-FED CHICKS. *Tohoku J. Exp. Med.*, 1959, 71, 19-25. (Prof. Okinaka's Clin., Sch. Med., Univ. Toyko.)—Chickens in 3 groups of 10 were given a mash diet to age 12 weeks and for 8 more weeks the same mash with cottonseed oil, 5 per cent., added. The second and third groups were each given in addition cholesterol, 2 per cent. of the diet, and the third had 1 mg. oestradiol daily by intramuscular injecton. Weight, feed intake and comb size were measured and cholesterol and lipid P were estimated in Plasma. Changes were studied in aorta and in arteries of brain, heart, kidney, lung, liver and spleen and graded from 0 to 4.

In the 3 groups mean values were for bodyweight 1982, 1942 and 2404 g., feed intake 451, 342 and 262 g. per kg. bodyweight per week, comb size 108, 100 and 48 sq. cm.; for plasma total cholesterol 160, 1415 and 2430, free cholesterol 34, 414 and 873, and lipid P 8, 14 and 76 mg. per 100 ml.

In the first group no lesion was seen in aorta or other arteries. In the second, deposition of fat had occurred in viscera and the average grading of lesions was for thoracic aorta 2.7, for intima of coronary arteries 2.5 and for intrarenal, intrahepatic and intrasplenic arteries, respectively, 1.0, 1.5 and 2.0. No infiltration was seen in intrapulmonary arteries. For 9 birds average grading for intracerebral arteries was 1.8. In the third group still more fat had been laid down in viscera and, on average, gradings were for aorta 3.4 and for intrarenal, intrahepatic and intrasplenic arteries 0.5, 0.8 and 1.9. For intracerebral arteries infiltration was slight and in coronary arteries it was slight in 5 and absent from the others. In intrapulmonary arteries there was none.

In relation to the effect of oestrogen on lipid infiltration arteries could be grouped as those in which it was enhanced, the aorta, or unaffected, intrahepatic and intrasplenic, or reduced, intracerebral, coronary and intrarenal. The findings are discussed in relation to extra-arterial supporting pressures in the tissues.—D. Harvey. (Nutrition Abstracts & Reviews)

LAKE, P. E. 1960. (Agric. Res. Coun. Poult. Res. Centre, Edinburgh.)
STUDIES ON THE DILUTION AND STORAGE OF FOWL SEMEN. *J. Reprod. Fertil.*, 1: 30-35.—Fowl semen was diluted 1 : 3 and stored at 0° to 2° C. for 24 and 48 hrs. before insemination. The diluents were 2 modifications of a glutamate-containing saline solution calculated to have an osmotic pressure equivalent to 0.98 to 1% sodium-chloride solution. The concentrations of sodium, potassium, magnesium and glutamate in the diluents were of the same order as those found in seminal plasma uncontaminated with cloacal gland fluid. Calcium was not added and the chloride concentration was low compared with undiluted seminal plasma. One modification of the diluent contained added fructose and the other was fructose-free.

Pullets were inseminated with 0.1 ml of the diluted semen. The proportion of fertile eggs laid by all pullets during days 2 to 6 following insemination with semen stored for 24 and 48 hrs. in the solution containing fructose was 64 and 47% resp. Fertility was significantly lower in pullets inseminated with semen stored in the fructose-free solution.—Author's summary. (Animal Breeding Abstracts)

LEHMAN, D., M. B. ENGEL, and D. M. LASKIN.
CHANGES IN SOLUBLE CITRATE OF PIGEON BONE DURING EGG LAYING. *Science*, 1959, 130, 222-223. [Univ. Illinois Coll. Dent., Chicago.]—Pigeons were killed at different stages of the cycle of medullary bone formation and resorption; in 8 birds no net bone formation or resorption was taking place, in 7 formation was in progress and in 15 resorption. The fluid of medullary bone was separated by aspiration; a fine wire screen, 100 mesh, was used to prevent the inclusion of most of the solid material. The fluids were dried and citric acid was estimated. The values during resting, apposition and resorption were 167 ± 82, 846 ± 203 and 1361 ± 304 μg. per g., respectively. On the assumption that the water content of the fluids was 80 per cent., the concentrations of citric acid in solution were 4.2, 21.2 and 34.0 mg. per 100 ml.

The metabolism of bone is discussed in the light of the results.—R. Hill. (Nutrition Abstracts & Reviews)

LEMONDE, A.
UREA PRODUCTION IN CHICK LIVER SLICES. *Canad. J. Biochem. Physiol.*, 1959, 37, 1187-1190. (Dept. Biochem., Sch. Med., Laval Univ., Quebec.)—Day-old chicks were started on a commerical diet and were killed at daily intervals up to 7 days or at 10, 15, 20 or 30 days of age. Feeding was usually stopped 24 hr. before the birds were killed by decapitation. Liver slices were tested in Warburg vessels with a modified Krebs Ringer bicarbonate medium; urea quotient was measured as μl. CO_2 from urea per mg. dry tissue per hr. incubation. It fell from 1.10 ± 0.040 to 0.61 ± 0.087 at 20 and 0.13 ± 0.048 at 30 days of age. The effect of starving birds at between 6 and 8 weeks of age for from

2 to 7 days was studied. When birds were metabolising their own tissues the urea quotients rose from 0.04 after 2 days to 1.59 after 7 days.—D. Harvey. (Nutrition Abstracts & Reviews)

LEROY, P. 1958. (Lab. Histophysiol., Coll. France, Paris.) Croissance de le crete du coq domestique maintenu a l'obscurite.

GROWTH OF THE COMB OF THE DOMESTIC COCK KEPT IN DARKNESS. *Ann. Endocr. (Paris)*, 19: 55-68.—Of twenty 3-mth. White Leghorn ♂♂, 10 were kept in normal light and 10 in a darkened room for 142 consecutive days; hypertrophy of the comb and testes occurred in the experimental group. When a similar experiment was carried out with 10 adults experimental and 10 adult control W.L. ♂♂, there was hypertrophy of the comb in the experimental group but testes volume and weight were less than those of the controls. (Animal Breeding Abstracts)

LOFLAND, H. B., and T. B. CLARKSON.

A BIOCHEMICAL STUDY OF SPONTANEOUS ATHEROSCLEROSIS IN PIGEONS. *Circulation Res.*, 1959, 7, 234-237. [Dept. Biochem., Bowman Gray Sch. Med., Wake Forest Coll., Winston-Salem, N.C.] Interlingua summary.—The cholesterol fractions in blood and aorta and the ocurrence of plaques in the aorta were investigated in four breeds of pigeon. All had the same diet of whole maize, kaffir corn, field peas and wheat, with a mineral mixture. In two breeds, White Carneau and Silver King, of which 12 male and 12 female birds were examined, a high incidence of atheromatous lesions was found. Of Racing Homers and Show Racers fewer birds were examined, but there was little evidence of plaques in the aorta. The occurrence of plaques in the aorta seemed to be unrelated to the concentration of total, free or ester cholesterol in serum or to the total phospholipid content. The weight of the aorta and its cholesterol content were increased in birds with atheromatous lesions.—A. M. Copping. (Nutrition Abstracts & Reviews)

LOHLE, K., and E. NAUJOK. 1958. Untersuchungen uber die durchschnittlichen Legezeiten bei rebhuhnfarbigen Italiener und weissen Leghornhennen.

INVESTIGATIONS ON THE AVERAGE LAYING TIMES OF BROWN AND WHITE LEGHORN HENS. *Dtsch. WirtschGeflugelz.*, 10: 281-283. From *Geflugelhof*, 1958 (6); by Mackrott.—In the years 1954-56 the av. time of day at which hens lay eggs was studied in 90 White and 170 Brown Leghorns at the Poultry Performance Testing Station at Altenberg/Kahla. Hens were trapnested hourly from 6 a.m. to 7 p.m. The av. laying times are tabulated monthly; they differed from month to month but all were about 10 or 11 o'clock. The av. laying times depend on the number of eggs in the clutch. For example, if a clutch of 3 eggs is laid, the 1st egg is laid at 7.59 a.m., and the 2nd and 3rd at 10.38 a.m. and 2.05 p.m. resp. on succeeding days. In an analysis of the percentage of hens laying at hourly intervals throughout the day, of the 50,358 eggs examined, the majority were laid between 8 and 11 a.m., relatively few being laid between 11 a.m. and noon. (Animal Breeding Abstracts)

LUTZ, H., and Y. LUTZ-OSTERTAG. 1959. (Soc. Embryol., Fac. Sci., Clermont-Ferrand.) Free-martinisme spontane chez les oiseaux.

SPONTANEOUS FREEMARTINISM IN BIRDS. *Developm. Biol.*, 1: 364-376.—As a result of an examination of more than 500 hen eggs with double yolks, 16 eggs were found that contained twin embryos of unlike sex. In 2 cases both the ♂ and the ♀ embryo were completely normal, but in the other 14 cases sexual deviations were observed. The ♀ embryos showed signs of masculination and the ♂♂ of feminisation. In the ♀♀ the Mullerian ducts showed regression and did not communicate with the cloaca. In the ♂♂ there was evidence of renewed proliferation of the germinal epithelium, presumably induced by small quantities of ♀ hormone. (Animal Breeding Abstracts)

MAINARDI, D. 1959. [Ist. Zool. Anat. Comp., Univ. Parma.]
IMMUNOLOGICAL DISTANCES AMONG SOME GALLINACEOUS BIRDS. *Nature* [*Lond.*], 184: 913-914.—On the basis of an immunological analysis of red cell antigens it is concluded that there is a close immunological affinity between the pheasant *(Phasianus colchicus)*, guinea fowl *(Numida meleagris)* and turkey *(Meleagris gallopavo)*—often regarded as belonging to 3 different families—while the domestic fowl *(Gallus domesticus)* and the Japanese quail *(Coturnix coturnix)*, which are both in the Phasianidae, are rather remote from each other and from the 3 other species. It is recommended that all the species named should be placed in the Phasianidae. (Animal Breeding Abstracts)

MALINOWSKA, W. 1958. (Dep. Anim. Anat. Histol., Coll. Agric., Cracow.)
ANATOMICO-HISTOLOGICAL INVESTIGATIONS ON INTERGENERIC HYBRIDS IN BIRDS OF THE PHASIANIDAE FAMILY. PART FIRST. FEMALE HYBRIDS. *Zool. Polon.*, 8 (1957): 335-348. (Polish summary.)—In order to determine the cause of infertility in intergeneric galliform hybrids, a study was made of the genitalia of a 4-yr-old ♀ hybrid between a silver pheasant hen and a Greenleg cock obtained by J. H. Marchlewski in 1949 *(see A.B.A.*, 19, No. 874) and of a ♂ and a ♀ hybrid (both 2 yrs. old) between a golden pheasant hen and a White Leghorn cock obtained later by the same breeder. The observed characteristics were compared with those of purebred birds of the parental species. The ovary of the silver pheasant hybrid was larger than that of either parental species, but the follicles were structurally abnormal and usually empty. The few ova found were considerably smaller than the follicles enclosing them, indicating that the follicles had continued to increase in size after the cessation of ovum development at an early stage in oogenesis. The oviduct was shorter and of wider diameter than in the parental species and muscularisation was weak. In the distribution of pigment in the dorsal plumage, the hybrid resembled the Greenleg fowl rather than the silver pheasant.

In the ♀ golden pheasant × domestic cock hybrid no ovary was present and the oviduct was rudimentary, with walls consisting solely of thin connective tissue lined with simple epithelium. The testes of the ♂ golden pheasant hybrid were only 7.5 mm. in length and 5 mm. in breadth compared with 36 mm. and 19 mm. resp. in the White Leghorn cock examined. (Animal Breeding Abstracts)

MANUNTA, G., and **A. MORONGIU** 1958. Sul contenuto in acido desossiribonucleinico delle cellule somatiche e sessuali di *Gallus gallus, Meleagris gallopavo, Columba domestica* e *Rana esculenta.*
THE CONTENT OF DEOXYRIBONUCLEIC ACID IN SOMATIC AND SEX CELLS OF THE FOWL, TURKEY, PIGEON AND EDIBLE FROG. *Studi sassaresi*, 36: 92-100. (B.) (French, English, German and Spanish summaries.)—Deoxyribonucleic acid has been detected in erythrocytes and spermatozoa of *Gallus gallus, Meleagris gallopavo, Columba domestica* and *Rana esculenta.* Spermatozoa have practically half the amount of this acid contained in the red blood cells, thus confirming the law of DNA constancy. Results are discussed in relation to the importance of DNA in the transmission of hereditary characters. (Animal Breeding Abstracts)

MARGOLF, P. H.
EFFECT OF DATE OF HATCH ON GROWTH AND MARKET QUALITY OF WHITE HOLLAND TURKEYS. *Pennsylvania Agric. Exp. Stat. Bull.* No. 660, September 1959, pp. 14.—Weight gain to 32 weeks, feathering, and dressing losses at 24, 26, 28, 30 and 32 weeks were studied in groups of turkeys hatched in March, May, June, August, November and January. Significant differences in liveweight were found between groups for both sexes. At 16 weeks those hatched in August were heaviest, but at later ages those hatched in May were heaviest. Feathering also differed among groups, and there were more carcases of higher grade among those hatched in May. Dressing losses were high in

those hatched in May compared with those hatched in June and August. The average length of daylight and environmental temperature during the trial are reported.—T. D. Bell. (Nutrition Abstracts & Reviews)

MARTIN, W. G., K. J. TURNER, and W. H. COOK.
MACROMOLECULAR PROPERTIES OF VITELLENIN FROM EGG YOLK AND ITS PARENT COMPLEX WITH LIPIDS. *Canad. J. Biochem. Physiol.*, 1959, 37, 1197-1207. (Div. Appl. Biol., Nat. Res. Counc., Ottawa, .)—A lipoprotein fraction consisting of 90 per cent. lipid was isolated from solutions of egg yolk as the supernatant layer on 2.5 per cent. NaCl solutions using the "layering" technique of Turner and Cook *(Canad. J. Biochem. Physiol.*, 1958, 36, 937). The material could not be fractioned by centrifuging in several solvents of density 0.8 or higher.

From the lipoprotein the protein vitellenin was prepared by removal of the lipid with chloroform, methanol and ether. It was not soluble in mild aqueous buffer solutions but was soluble in dilute NaOH, hydrazine, dichloroacetic acid and formic acid. Molecular weight values ranged from 3.0 to 9.0 $\times$ 10^4; the higher value is considered to be the more reliable though it is only half the estimated molecular weight of the protein part of the intact lipoprotein.—G. A. Garton. (Nutrition Abstracts & Reviews)

MATSUDA, Y., and I. IWAMURA. 1956.
CHEMICAL STUDIES ON FERTILITY AND SEX DIFFERENCES OF EGGS. 1. THE RATIO OF ARGININE TO TRYPTOPHANE IN FERTILISED AND NON-FERTILISED EGGS OF THE DOMESTIC FOWL. *Bull. Fac. Agric. Univ. Miyazaki*, 1: 196-200. [Japanese with English summary.] Abstract in *Biol. Abstr.*, 1959, 33, No. 42113. (Animal Breeding Abstracts)

MC CARTNEY, M. G., and K. I. BROWN. 1959 [Dep. Poult. Sci., Ohio Agric. Exp. Sta., Wooster.]
SPERMATOZOA CONCENTRATION IN THREE VARIETIES OF TURKEYS. *Poultry Sci.*, 38: 390-394.—To estimate differences in spermatozoal concentration between varieties of turkeys, semen samples from Bronze, Large White, and Small White ♂♂ were collected from Jan. to May. Cell concentration was determined by 3 methods: (1) haemocytometer technique, (2) sperm cell volume and (3) optical densities. Analysis of variance of the data from methods (1) and (2) revealed a highly significant interaction effect between collection periods and varieties. The sperm concentration remained different between the 3 varieties and increased from Jan. to May in all 3: however, these data were not significant. The figures for optical density, obtained at any individual date of collection, appear to permit assessment of sperm concentration. On the other hand, a series of optical density readings over a period of several months is subject to considerable error, for some unknown technical reason. (Animal Breeding Abstracts)

McDANIEL, G. R., and J. V. CRAIG. 1959. (Dep. Poult. Husb., Kansas State Coll., Manhattan.)
BEHAVIOR TRAITS, SEMEN MEASUREMENTS AND FERTILITY OF WHITE LEGHORN MALES. *Poult. Sci.*, 38: 1005-1014.—Studies were conducted on 120 White Leghorn cockerels to estimate the relationships between various behaviour and semen characteristics and the association of these traits with fertilising capacity in natural matings. Significant and highly significant associations were found between social aggressiveness scores, sexual effectiveness scores (number of successful matings in a 10-min. period) and crouches elicited from ♀♀. Highly significant positve correlatons were obtained among measurements and scores of semen volume, sperm concentration and motility. Significant and almost significant correlations, but of relatively low magnitude, were obtained among some of the behaviour and semen traits. Fertility of ♂♂, grouped according to their social aggressiveness and sexual effectiveness scores, was tested in mass matings. Sexual

effectiveness scores were significantly associated with fertility; however, no relationship appeared to exist between social aggressiveness scores and fertility. Semen appearance scores (which are associated with concentration $r = 0.76$ $P<0.01$) of ♂♂ used in individual matings were significantly associated with fertility ($r = 0.61$ $P<0.05$). Semen volume and days required for volume and appearance to plateau after removal of these ♂♂ from the breeding pens did not appear to be related to fertility. Differences in fertility of groups of ♂♂ in individual matings, classified as high, medium or low for sexual effectiveness scores, closely approach significance ($P = 0.06$).—Author's summary. (Animal Breeding Abstracts)

MEDWAY, W., and **M. R. KARE.**
WATER METABOLISM OF THE GROWING DOMESTIC FOWL WITH SPECIAL REFERENCE TO WATER BALANCE. *Poultry Sci.*, 1959, 38, 631-637. [Dept. Physiol., New York State Vet. Coll., Cornell Univ., Ithaca.]—Water balance of White Leghorn chickens was studied at 1, 2, 3, 4, 6, 8, 16 and 32 weeks of age. Temperature in the batteries was kept in the range of thermal neutrality and a minimum surface of drinking water was exposed to evaporation. Faeces were collected under mineral oil.

Mean bodyweight rose from 61.9 g. at 1 week to 2035.2 at 32 weeks. Feed intake rose from 10.4 g. per bird at 1 week to 136.2 at 32 weeks. Water consumption as liquid at the corresponding ages was 26.6 ml. per chick rising to 483.5, and water intake from feed was 1 ml. per bird at 1 week rising to 12.4 at 32 weeks. Daily water output in the faeces and by evaporation was 16.6 and 3.3 g., respectively, at 1 week, rising to 319.2 and 53.0 g. at 32 weeks; output of water per egg laid was 34.7 g. Birds at all ages were in positive water balance ranging from 7.6 g. at 1 week to 89.1 at 32 weeks. Water consumed per g. feed was from 2.1 to 2.6 ml., except at 32 weeks when it was 3.6. Total excrement per g. feed consumed was from 1.5 to 2.0 g., except at 32 weeks when it was 2.7.—J. S. Thomson. (Nutrition Abstracts & Reviews)

MEHNER, A., and **J. SOMMERFELD** 1959. (BundesforschAnst. Kleintierz., Celle). Versuche uber den Einfluss der Schockbeleuchtung auf die Legetatigkeit.
EXPERIMENTS ON THE EFFECT OF FLASH LIGHTING ON LAYING ACTIVITY. *Arch Geflugelk.*, 23: 174-183. (English summary.) —A small pilot experiment held during the winter mths. indicated that a 3 sec. flash with a 500 watt bulb at hourly intervals between 10 p.m. and 5 a.m. stimulated laying activity in White Leghorn pullets. In the following year another experiment was held, this time with hens, from 1st Nov. 1957 to 31st March 1958. The length of flash was increased to 10 secs. Three groups each containing 30 White Leghorns were used. One group was flash-lighted as above, another was artificially lighted for 12 hrs., and the 3rd was kept without artificial light. The av. number of eggs laid per hen for the group with flash lighting was 70.5 *v.* 57.6 for the artificially lighted group and 40.0 for the controls. When egg production was considered up to 31st Aug. it was found that although egg production was stimulated by flash lighting during the winter months, it fell off during the summer, thus making the over-all yield for this group 144.9 eggs *v.* 143.8 eggs of the controls. The artificially lighted group, however, averaged 153.1 eggs. The commercial use of flash lighting will depend on whether there is a seasonal variation in egg prices (Animal Breeding Abstracts)

MELENDY, J. W., F. X. OGASAWARA, and **W. O. WILSON.** 1959. (Poult. Husb. Dep., Univ. California, Davis.)
FERTILITY AND HATCHABILITY OF CHICKEN EGGS PRODUCED BY HENS WITH INDUCED HYPERTHERMY. *Poult. Sc.*, 38: 982-983.—Fourteen-mth-old White Leghorn and Leghorn × New Hampshire pullets were exposed for 30-90 mins. at 104° F. Neither fertility nor hatchability was reduced by this short-term hyperthermy. (Animal Breeding Abstracts)

MERAT, P. 1959. Couleur des pattes et de la chair. Mortalite dans une population de volailles.

SHANK AND FLESH COLOUR. MORTALITY IN A FLOCK OF FOWLS. *Ann. Zootech. (Paris)*, 8: 179.—In a flock, originating from a cross, where a number of sister families had some chicks with yellow shanks *(ww)* and some chicks with white or pink shanks *(WW* or *Ww)*, percentage mortality at 8 wks. of age was 27.3 for *WW* birds and 22.3 for *ww* birds, the difference in survival rate of ♀♀ with yellow shanks and flesh approaching the 1% level of significance. (Animal Breeding Abstracts)

MERAT, P. 1959. Le role du facteur autosomal d'emplumement dans la croissance en poids chez les volailles.

THE ROLE OF THE AUTOSOMAL FEATHERING FACTOR IN WEIGHT INCREASE IN THE FOWL. *Ann. Zootech. (Paris)*, 8: 180-181.—In a study of 4 different populations of fowl carrying the sex-linked gene for rapid feathering *(kk, k-)*, a positive relationship was found between feathering rate due to an autosomal factor and body weight at 8 wks. The relationship was more marked in ♀♀ than in ♂♂. Body weight was more unifrom in well-feathered birds, particularly in the case of ♀♀. In the birds studied, early autosomal feathering was associated also with slightly earlier sexual maturity, and, possibly, lower mortality between 12 wks. of age and the following 31st Dec. (Animal Breeding Abstracts)

MERRITT, E. S. and **R. W. E. CLARRIDGE.** 1959. (Anim. Poult. Sci. Div., Exp. Farms Serv., Ottawa, Ont.)

THE EFFECT OF LENGTH OF HOLDING ON THE HATCHABILITY OF GOOSE EGGS. *Poult. Sci.*, 38: 660-663.—Incubation data on about 12,000 eggs from a flock of Pilgrim geese selected for egg production were analysed for 3 yrs. During 1956, when eggs were held for 1-7 days before setting, there was no decline in hatchability. During 1957 and 1958, when eggs were held for 1-14 days, a comparison showed that there was a decline in hatchability of 5% in eggs held 8-14 days *v.* those held 1-7 days. The decline up to 10 days was, however, slight, and it is concluded that under good conditions 10 days is the longest holding period for ensuring maximum hatchability of goose eggs. (Animal Breeding Abstracts)

MILLER, E. C., J.S. O'BARR, and **C. A. DENTON.**

THE METABOLISM OM METHIONINE BY SINGLE COMB WHITE LEGHORN AND BLACK AUSTRALORP CHICKS. *J. Nutrition*, 1960, 70, 42-46, (Poultry Res. Branch, Animal Husb. Res. Div., Agric. Res. Serv., Beltsville, Md.)—When day-old chicks housed in electrically heated batteries were fed on a basal diet containing a low level of S-amino acids a supplement of methionine significantly increased growth rate of both White Leghorn and Black Australorp chickens. A supplement of cystine had no effect on growth rate when the diets contained adequate methionine. There was no significant difference in growth rate between the breeds under these conditions although it seemed that White Leghorns required more methionine than did Black Australorps.

When ^{35}S-methionine was injected intramuscularly, the recovery of ^{35}S was about 100 per cent., 43 per cent. in the droppings during the 4 days of the experimental period. The rate of conversion of methionine to cystine was found to be lower in Black Australorp than in White Leghorn chickens.—J. G. Gordon. (Nutrition Abstracts & Reviews)

MILLER, V. L., G. E. BEARSE, and **K. E. HAMMERMEISTER.** 1959. (Western Washington Exp. Sta., Washington State Univ., Puyallup.)

MERCURY RETENTION, A TRAIT OF CHICKENS. *Poult. Sci.*, 38: 1037-1039.—In 2 strains of White Leghorns, one selected for resistance to leucosis was found to retain approx. 3 times as much mercury in the kidneys as did the one selected for susceptibility. Data from reciprocal cross F_1 chicks indicated that they resembled the parent with

poor mercury retention more closely than the one retaining large amounts of mercury, and there were no sex differences. (Animal Breeding Abstracts)

MINER, J. J., S. J. MARSDEN, and **C. A. DENTON.**
THE EFFECT OF DIETHYLSTILBESTROL-METHIMAZOLE AND DIENESTROL DIACETATE ON TURKEY BROILERS. *Poultry Sci.*, 1959, 38, 750-757. [U.S. Dept. Agric., Animal Husb. Res. Div., Agric. Res. Serv., Beltsville, Md.]—Beltsville Small White turkey poults were reared to 16 weeks and Broad Breasted Large Whites to 13 weeks on a ration with protein 28 and fat 1 per cent., alone or supplemented with 31.75 mg. dienoestrol diacetate (DD) per lb. A further group of each variety had an injection of 10 mg. diethylstilbestrol and 3 mg. methimazole (D—M) 3 weeks before the end, and other groups had the basal ration supplemented with 7 per cent. fat without hormones. Weight gain during the final 3 weeks was not significantly improved in either variety by DD but was improved in the large type by added fat. Finish of the birds of both varieties was improved by hormones, more in the large type. Finish of the Small Whites at 16 weeks was better than that of the Large Whites at 13 weeks, and Small Whites not given hormones had a better finish than Large Whites given hormones. Feeding efficiency was not improved by hormones, but was improved by added fat.

In another trial with Beltsville Small Whites the same high-protein ration was used but the protein was reduced to 21 per cent. in all groups after 8 weeks. Hormones and fat were given as above, and an additional group had 7.94 mg. DD per lb. ration for the entire period of 16 weeks. The low level of DD depressed growth, the high level and D—M had no effect. Feed efficiency was improved by the high-fat ration. Finish was slightly improved by the high level of DD, by D—M and by the high fat ration.

Groups of 4-week-old Small Whites were reared to 14 weeks on a ration in which protein content was gradually reduced from 28 to 21 and then to 16 per cent. The fat content was 8 per cent. Weight gain was not affected by either the high or low level of DD but was significantly improved by D—M. Feed efficiency was improved by the hormones. Finish was best with the hormone injection and poorest with DD at both levels.

Groups of Broad Breasted Large Whites reared alike to 10 weeks were given for a further 3 weeks rations containing 22, 19, 16 or 13 per cent. protein, with or without an injection of hormone. Rate of gain in both injected and non-injected birds decreased as protein level fell. Difference in rate of gain between the groups was greatest on 13 per cent. protein and least on 22 per cent. Finish was significantly improved by the hormone at all levels, though no group attained a satisfactory finish.—J. S. Thomson. (Nutrition Abstracts & Reviews)

MIZUMA, Y. 1959. (Dep. Anim. Husb., Tohoku Univ., Sendai.)
STUDIES ON THE EFFECT BY THE EMBRYONIC ENVIRONMENT ON THE CHARACTERS OF CHICKENS. I. THE INFLUENCE OF ALBUMEN EXCHANGE IN POULTRY EGG ON HATCHABILITY. *Tohoku J. agric. Res.*, 10: 43-57.—Part-exchanges of albumen (usually 10-15 ml.) were made between White Leghorn, Rhode Island Red and Barred Plymouth Rock eggs. Albumen from duck and Japanese quail eggs was also introduced into W.L. and R.I.R. eggs after the removal of an equal quantity of the original albumen. The hatchability of treated eggs was higher when the albumen transfer was carried out between 48 and 81 days of incubation than when it took place before incubation or at an earlier stage of incubation. The effects of albumen transfer on the hatchability of fertile eggs were not consistent and appeared to depend on the particular donor-recipient combination. For example, W.L. eggs receiving quail albumen had a higher hatchability than similarly treated R.I.R. eggs. R.I.R. eggs receiving duck albumen hatched well, whereas no chicks were obtained from W.L. eggs re-

ceiving duck albumen. W.L. eggs reciving B.P.R. albumen had a higher hatchability than those receiving R.I.R. albumen. In some experiments the hatchability of the experimental eggs was higher than that of control eggs injected with albumen removed from themselves. There was a tendency for egg albumen transfer to improve the hatchability of eggs from hens that laid eggs with low hatchability, and it is suggested that the introduced albumen might have provided substances necessary for embryo development that were lacking in the original albumen. (Animal Breeding Abstracts)

MOISEEVA, I. G. 1959. (Inst. Genet., Acad. Sci. U.S.S.R., Moscow.) Ob izmenenii pola u kur.

CHANGING THE SEX OF FOWLS. *Vestn. sel.-hoz. Nauk. VASHNIL (Mosk.)*, 4 (8): 116-117.—Work done in the West on the effect of hormones on the sex of fowl embryos is summarised without references. (Animal Breeding Abstracts)

MORGAN, W., and **A. ADAMS.** 1959. (South Dakota Agric. Exp. Sta., Brookings.)

IDENTIFICATION OF TWO OVIDUCTS IN LIVE HENS. *Poult. Sci.*, 38: 861-864.—A method is described which permits live classification of hens with 2 oviducts. Autopsy data verify that the external examination method is, within limits, valid. In this study, SD-11 hens with right oviducts which measured more than half the length of their corresponding left oviducts were positively identified as double oviduct hens prior to autopsy. Hens which were classified as having only 1 oviduct prior to autopsy frequently had, in addition, a short or vestigial right oviduct. There was no correlation between identity of a small right oviduct in live hens and relative length of that organ.—Authors' summary (Animal Breeding Abstracts)

MORITA, M. 1959. [Moka Agric. High Sch., Tochigi Prefecture.]

EFFECT OF OESTROGEN ON MALE CHICKS.] *Jap. J. zootech. Sci.*, 30: 27-32. [Japanese with English summary.] In 1954-56, experiments were carried out on the chemical castration of [S.C. White Leghorn and Barred Plymouth Rock] ♂ chicks with different types of diethylstilboestrol administered in various amounts over various periods of time. Although no significant increase in growth was obtained in the 1956 experiment, body weight increased by about 10% and 20% in the other experiments. Treated birds showed an increase in the fat content of the muscle. The colour of the meat improved (more yellow), but the tissues became somewhat looser. In the 1954 experiment, thick fat was deposited in the abdominal region. Histological investigations revealed no distinct castration effects in the pituitary. The anterior lobe was most poorly developed in chicks receiving oestrogen early in life (2-40 days of age). The testes of treated birds were likewise poorly developed. —Abstract of summary. (Animal Breeding Abstracts)

MUELLER, W. J.

THE EFFECT OF ENVIRONMENTAL TEMPERATURE AND HUMIDITY ON THE CALCIUM BALANCE AND SERUM CALCIUM OF LAYING PULLETS. *Poultry Sci.*, 1959, 38, 1296-1301. (Dept. Poultry Husb., Pennsylvania State Univ., University Park.)—For about 9 months 4 groups of White Leghorn laying pullets were kept on a practical all-mash ration containing 2.34 per cent. Ca under the following conditions of temperature and relative humidity (RH): 85° F. and 70 per cent. RH; 55° and 70 per cent., 85° and 25 per cent. or temperature and RH uncontrolled. Egg shell thickness, including membrane, was estimated monthly, Ca balance studies were made at 2-month intervals and each month Ca was estimated in the blood.

Average shell thickness for the groups in the above order was 0.373, 0.400, 0.384 and 0.392 mm. and all differed significantly. Feed intake was highest in the uncontrolled environment, the daily amounts per bird being 90.5, 113.4, 101.7 and 123.5 g., respectively. The intake of the uncontrolled group was significantly higher than those of the 2

high temperature groups, but not of the low temperature. Ca intakes were 2.12, 2.65, 2.38 and 2.89 g. per bird per day, respectively, but the higher intakes were offset by lower retentions, the amounts retained per bird being 1.08, 1.02, 0.95 and 0.87 g. per day. Ca secreted in the eggs was 1.01,1.04, 0.96 and 0.88 g. per bird per day, so that the amount secreted in, or removed from, the bones was negligible. The correlations between shell thickness and Ca intake or percentage Ca retention were small but that between Ca secretion in eggs and percentage retention was high, $r = +0.89$, as was that between Ca in eggs and Ca intake, $r = +0.49$. Average values for serum Ca in the 4 groups were 21.2, 23.4, 22.8 and 25.1 mg. per cent. and the value was positively correlated with Ca intake, percentage Ca retention and Ca secretion in the egg. Serum Ca was negatively correlated with shell thickness, $r = -0.30$.—J. S. Thomson. (Nutrition Abstracts & Reviews)

MUELLER, W. J., and A. A. AMEZCUA. 1959. (Dep. Poult. Husb., Pennsylvania State Univ., University Park.)
THE RELATIONSHIP BETWEEN CERTAIN THYROID CHARACTERISTICS OF PULLETS AND THEIR EGG PRODUCTION, BODY WEIGHT AND ENVIRONMENT. *Poult. Sci.*, 38: 620-624.—Seventy-one Single Comb White Leghorn pullets were used to investigate the effect of environmental temperature and relative humidity on rate of disappearance of I^{131} from the thyroids, dose of injected l-thyroxine necessary to arrest I^{131} secretion, and thyroid weight. In addition the relationships among the 3 thyroid characteristics, egg production, and body weight were studied. Both I^{131} secretion rate and dose of injected l-thyroxine necessary to arrest I^{131} secretion, were correlated with egg production during the 13 days following I^{131} injection. However, only the correlation between l-thyroxine dose and total egg production was significant. Body weight was only correlated with thyroid weight and there were no significant correlations among the 3 thyroid characterstics.—From authors' summary. (Animal Breeding Abstracts)

NESHEIM, M. C., S. L. LEONARD, and M. L. SCOTT.
ALTERATIONS IN SOME BIOCHEMICAL CONSTITUENTS OF SKELETAL MUSCLE OF VITAMIN E-DEFICIENT CHICKS. *J. Nutrition*, 1959, 68, 359-369. [Dept. Poultry Husb., Cornell Univ., Ithaca N.Y.] Three experiments are described. The diets were for the first the torula yeast diet without added methionine and with 0.02 mg. Se per kg. diet and for the others the purified diet described earlier (Abst. 3821, Vol. 29). For some vitamin E as *d*-α-tocopheryl acetate was added, 160 mg. per kg. diet in the first and 80 mg. per kg. in the second and third experiments. Phosphorylase activity was estimated by the method described by Leonard (*Endocrinology*, 1957, 60, 619) for mammalian muscle, adapted for chick muscle by reduction of the amount of fresh tissue used and of adenylic acid per reaction tube.

Out of 10 deprived chicks examined from each experiment the numbers showing white muscle, chiefly as striations in breast muscle, were 7, 9 and 9; none of those given vitamin E showed dystrophic change. Phosphorylase, active and total, and glycogen content were less in affected than in normal white, breast, muscle and glycogen was less in red, leg, muscle. There was more phosphorylase in white than in red muscle, but the ratio of active to total enzyme was the same. Muscles of deprived chicks had a high water content and changes in the ash, Na, K and creatine contents of fresh muscle were referable to the change in water content, except for Na of breast muscle, which was high in terms of fresh and dry weight.—I. Leitch. (Nutrition Abstracts & Reviews)

NICHITA G., I. POPESCU, G. BURLACU, N. HAIMOVICI, S. BOIAN, and E. BRATU. 1958. Bazele fiziologice ale ridicarii, productiei de oua si carne la pasari. Nota I. Nota II.
PHYSIOLOGICAL BASIS FOR INCREASING EGG AND MEAT PRODUCTION OF POULTRY. I. II. *Stud. Cercet. Biol. Acad. Republ. Pop. Romin., Ser. Biol. Anim.* 10: 69-76, 77-85. (Russian and French

summaries.) From abstracts in *Referat. Z., Biol.*, 1959 (23), Nos. 102308 and 102309.—I. Data on egg production, metabolism and the economic aspects of breeding were obtained from Leghorn and Rhode Island fowls and from Khaki Campbell and Pekin ducks. Egg production was highest for the Leghorns, and all the breeds tested proved good meat birds except the Pekin ducks, which were economic only at 10 wks. of age with a live weight of 2 kg.

II. Growth and metabolism were studied in fowls to 10 mths. of age and in ducks to 6 mths. of age. (Animal Breeding Abstracts)

NIKKILA E. A. and **O. OLLILA.**

EFFECT OF ALCOHOL INGESTION ON EXPERIMENTAL CHICKEN ATHEROSCLEROSIS. *Circulation Res.*, 1959, 7, 588-594. (1. Dept. Med., Univ. Helsinki.) Interlingua summary.—Six groups of 35 cockerels aged 7 weeks were given a normal diet alone, or that diet or a low-protein diet with cholesterol 1.5 per cent. added; each diet was given with water or with 7 per cent. ethanol to drink. Plasma cholesterol was measured before and 5, 11 and 18 weeks after the experiment began. Continuous intake of alcohol caused significant increase of plasma cholesterol with all diets, but did not affect the incidence of spontaneous or induced atherosclerosis in any group.—A. M. Copping. (Nutrition Abstracts & Reviews)

NIKOLAEVA, Ju. N. 1958. Vlijanie periodiceskih podogrevov jaic pri ih hranenii na izmenenija blastodiskov i rezuljtaty inkubacii.

THE EFFECT OF PERIODICALLY HEATING EGGS DURING HOLDING ON CHANGES IN THE BLASTODISC AND IN HATCHABILITY. *Bjull. nauc.-teh. Inform. vsesojuz. nauc.-issled. Inst. Pticev.*, 1958 (3): 26-30. From abstract in *Referat. Z. Biol.*, 1959 (23), No. 102321.—A total of 7410 eggs from Russian White hens was held for 15-20 days before setting. No changes were noted in the size or histological structure of the embryonic disc, except in eggs kept at an atmospheric temp. of 6°-14°, relative humidity 75-85%, and heated for short periods at about 37.5°-40°, when gradual, but limited, embryonic development occurred; hatchability was not reduced. (Animal Breeding Abstracts)

NOVIK, I. E., and **G. KOPYLOVSKAJA Ja.** 1958. K. voprosu o processah ovuljacii i oplodotvorenija u kur.

THE PROCESS OF OVULATION AND FERTILISATION IN THE FOWL. *Trud. Inst. Genet. (Mosk.)*, No. 24: 395-365.—In the hen ovulation occurs 15-25 mins. after the laying of the previous egg; the 3 phases of ovulation are described. A series of experiments was carried out in which ovulated, ovulating, and mature follicles not yet ovulated were transferred from an inseminated or non-inseminated donor to a non-inseminated or inseminated recipient resp. Fertile eggs were laid only when ovulated ova from a non-inseminated donor were transferred to an inseminated recipient; none of the embryos survived the first 6-7 days of incubation. (Animal Breeding Abstracts)

NOVOTNY, I. 1958. Predbezna zprava o postnatalnim rustu a vyvoji kurat plemen leghorny bile (LB) a rodajilenkv (RI).

PRELIMINARY REPORT ON POSTNATAL GROWTH AND DEVELOPMENT IN WHITE LEGHORN (WL) AND RHODE ISLAND (RI) CHICKS. *Sborn. vysoke Sk. Zemed. Lesnicke (Brno), A*, 1958 (2): 225-243. (Russian and English summaries.)—Data were collected on body weight increases, growth rate of the bone, internal organs and feathers and on the 1st moult in 6 ♂ and 9 ♀ White Leghorns and 7 ♂ and 10 ♀ Rhode Island Reds. Data are presented graphically. (Animal Breeding Abstracts)

OLBRYCHTOWA, F., and **B. BZOWSKA.** 1959. (Dep. Gen. Anim. Breed., Agric. Coll., Wroclaw.) Immunologiczne wlasciwosci plemnikow kogutow.

THE IMMUNOLOGICAL PROPERTIES OF COCK SPERMATOZOA. *Med. wet.*, 15: 711-712.—Two rabbits were each given several

intramuscular injections of 1.2 ml. cock spermatozoa suspended in a sodium citrate solution. The spermatozoa were obtained from the centrifuged semen of 3 Greenleg and 4 Sussex cocks. The serum of a non-immunised rabbit was used as a control. Agglutination of the cock spermatozoa took place in the immune sera of the 2 rabbits at titres of 1:2048 and 1:1024 resp. compared with a titre of 1:16 in the non-immune serum of the control. The serum of rabbits immunised with sperm from a cock of either breed caused agglutination of the sperm both of its own breed and of the other breed, but it failed to cause the agglutination of bull spermatozoa. Microscopic examination of the agglutinated spermatozoa revealed that they were alive and that only their heads were clumped together, the tails being free and actively motile. The sperm heads were not in direct contact with each other but were surrounded and held together by a dense, sticky substance. (Animal Breeding Abstracts)

OLSEN, E. M., J. D. HARVEY, D. C. HILL, and **H. D. BRANION.**
DISTRIBUTION OF CAROTENE AND VITAMIN A IN THE TISSUES OF CHICKS FOLLOWING ADMINISTRATION OF CAROTENE. *Poultry Sci.*, 1959, 38, 688-693. [Dept. Nutrit., Ontario Agric. Coll., Guelph.] The chicks used were from a stock which had been fed for 4 generations on rations devoid of carotenoids and low in vitamin A. They were given a vitamin-A-deficient ration for 11 days, after which 2 were killed for estimation of carotene and vitamin A in liver, lungs and a portion of unwashed intestine from the gizzard to the point of attachment of the volk sac. The other 20 chicks were each given in feed 1 mg. β-carotene dispersed in an aqueous medium containing 5 per cent. Tween 60; they were killed in pairs at intervals during the next 24 hr. and carotene and vitamin A were estimated in the same tissues.

Deprived chicks showed per organ 10 μg. carotene and 0.5 I.U. vitamin A in the intestine and no carotene and 1.2 I.U. vitamin A in the liver. After ingestion of carotene there was an immediate and rapid rise of carotene and vitamin A in the intestine, followed by a rapid fall to near the initial level within 24 hr., the peak for carotene, about 625 μg. per organ, occurring after about 1 hr. and for vitamin A, about 43 μg., after 4 hr. Vitamin A in the liver rose to a peak of 80 I.U. per organ in 8 hr. and remained at that level for the rest of the period. Carotene in the liver scarcely rose above the initial level. Negligible amounts of carotene and vitamin A were found in the lungs.

In a second similar experiment birds were given an injection into the heart of 3 ml. plasma or of 3 ml. of a carotene suspension in plasma, containing 50μg. carotene per ml., and carotene and vitamin A were estimated in heart, liver, lungs, kidney, spleen, duodenum, duodenal contents and blood plasma at intervals over 21 days. Carotene was found in all the tissues examined except blood plasma and though after 1 hr. carotene content was highest in the heart, liver was the chief site of storage and relatively large amounts were found also in the lungs and duodenum. There was no evidence that carotene was excreted into the duodenum. Up to 2 hr. a third of the injected carotene was found in the organs examined, after 4 days about 3 per cent.; some was still found after 21 days. From a comparison of values for vitamin A in the tissues of birds without and those injected with carotene it was evident that none of the carotene had been converted to vitamin A. J. S. Thomson. (Nutrition Abstracts & Reviews)

OUSTERHOUT, L. E.
COMPARATIVE THREONINE, VALINE, HISTIDINE, AND GLUCOSE OXIDATION IN CHICKS. *Proc. Soc. Exp. Bio. Med.*, 1959, 102, 285-287. (Dept. Poultry Husb., Univ. California, Davis.)—Threonine, valine, histidine or glucose, uniformly labelled with ^{14}C, was injected intraperitoneally into young chicks, and oxidation was estimated by counts of $^{14}CO_2$ respired. During 14 hr. 50 per cent. of the glucose, 40 per cent. of the valine, 25 per cent. of the histidine and 10 per cent. of the threonine was thus recovered. Most of the activity remaining in

the tissues was in proteins precipitable with picric acid and there was little in free amino acids. Variations in amino acid content of diets produced no change in the results.—E. Hobson. (Nutrition Abstracts & Reviews)

PEREK, M., B. ECKSTEIN, and Z. ESHKOL.
THE EFFECT OF ACTH ON ADRENAL ASCORBIC ACID IN LAYING HENS. *Endocrinology*, 1959, 64, 831-832. [Hebrew Univ., Jerusalem.] One hr. after intravenous injection of 10 I.U. adrenocorticotropic hormone (ACTH) into one-year-old laying hens and 3-month-old pullets the adrenal glands contained 70 and 329 mg. ascorbic acid per 100 g. Corresponding values for birds after injection of saline solution were 161 and 335; the adrenal weights, 138 and 91 mg., were not significantly altered by ACTH. [The absolute amounts of ascorbic acid tabulated in mg. per cent. should presumably be μg.]—A. Hepburn. (Nutrition Abstracts & Reviews)

PICCHI, G. Risultati sulla crescenza ed osservazioni istologiche in polli alimentati con antibiotici.
GROWTH AND HISTOLOGICAL FINDINGS IN CHICKENS FED ON ANTIBIOTICS. *Zootec. Vet.*, 1958, 13 98-106. (Ist. Zootec. Gen., Fac. Med. Vet., Univ. Camerino.) English summary. (Nutrition Abstracts & Reviews)

POZO LORA, R. 1959. [Dep. Zootec., Cons. Sup. Invest. Cient., Cordoba.] Estudio de las variaciones estacionales de la fertilidad de los patos Khaki Campbell.
[STUDY OF THE SEASONAL CHANGES OF THE FERTILITY OF KHAKI CAMPBELL DUCKS.] *Arch Zootec.* [Córdoba], 8: 225-241. [French and English summaries.] Two consecutive periods of incubation of Khaki Campbell ducks (Nov.-June and Sep.-July) were studied in Córdoba, Spain, and 222, 133 eggs were laid. The 2 periods showed no significant difference in fertility level, but there was a significant difference between months and season levels, fertility being greatest in March-June of each year. These were correlated with 12-14½ hrs. of daylight and av. midday temp. of 15°-20° C.; as midday temperature began to increase, fertility levels fell. When the combined light and temperature effects were studied, there was a positive correlation between length of light and fertility (the temperature being fixed) but no correlation existed if temperatures varied and light time was fixed. (Animal Breeding Abstracts)

POZO LORA, R., and J. CARRANZA. 1959. Influencia de la iluminacion artificial suplementaria y de la hormona gonadotropa sobre la fertilidad de los patos Khaki Campbell.
[INFLUENCE OF SUPPLEMENTARY ARTIFICIAL LIGHT AND GONADOTROPIC HORMONE ON THE FERTILITY OF KHAKI CAMPBELL DUCKS.] *Arch. Zootec* [Córdoba], 8: 277-284. [English summary.] The authors carried out a series of experiments to ascertain if increased light or hormone treatment could improve the poor laying quality of the breed. Two hundred and eighty ♀♀ and 28 ♂♂ were used and 3271 eggs were laid during the experimental period (Feb.). Results were as follows: with artificial light increasing illumination to 13½ hrs. per day, a mean fertility of 66.76% was obtained. The hormone-treated group received, per duck, 50 units of gonadotropin diluted in saline and had a mean fertility of 47.32%. The untreated control group had a mean fertility of 36.95%.
It is concluded that increased light significantly improved lay, but that hormone treatment had no significant effect. (Animal Breeding Abstracts)

PREMACHANDRA, B. N., G. W. PIPES, and C. W. TURNER.
STUDY OF GROWTH IN NEW HAMPSHIRE CHICKENS WITH VARYING THYROID STATUS. *Poultry Sci.*, 1959, 38, 796-798.

[Dept. Dairy Husb., Univ. Missouri, Columbia.] (Nutrition Abstracts & Reviews)

PREMACHANDRA, B. N., G. W. PIPES, and **C. W. TURNER.** 1959. (Dep. Dairy Husb., Univ. Missouri, Columbia.)

STUDY OF GROWTH IN NEW HAMPSHIRE CHICKENS WITH VARYING THYROID STATUS. *Poult. Sci.*, 38: 795-798.—A study of growth in 2 lines of New Hampshire chickens, selected on the basis of "high" and "low" thyroid enlargement on a constant oral level of thiouracil, did not reveal appreciable differences in body weight at any time till maturity. Of the several progeny evolved by mating ♂♂ of varying thyroxine secretion rate with similar ♀♀, only high × high thyroxine secretion rate progeny remained superior to other progeny both in the rate of growth and in mature body weight.—Authors' summary. (Animal Breeding Abstracts)

ROGLER, J. C., H. E. PARKER, F. N. ANDREWS, and **C. W. CARRICK.** 1959. (Purdue Univ. Agric. Exp. Sta., Lafayette, Ind.)

EFFECTS OF THIOURACIL AND THYROXINE ON CHICK EMBRYO DEVELOPMENT. *Poult. Sci.*, 38: 1027-1032.—The injection of 2 mg. thiouracil into the albumen of eggs prior to incubation failed to affect embryo development at 4, 6, or 8 days of incubation, but at 10 days and all subsequent periods studied, a consistent reduction in embryo size resulted from the thiouracil treatment. Thiouracil injection also reduced hatchability, delayed hatching time by approx. 2½ days, and increased thyroid size in the embryos and chicks hatched. The injection of various amounts of thyroxine (2, 4, 8, or 16 μg.) into the albumen before incubation, and in some instances followed by an additional injection either into the air cell or allantoic sac at 17 days of incubation, had very little effect on time of hatch or chick thyroid size.—From authors' summary. (Animal Breeding Abstracts)

ROMANOFF, A. L. 1960. (Cornell Univ., Ithaca, N.Y.)

THE AVIAN EMBRYO. STRUCTURAL AND FUNCTIONAL DEVELOPMENT. *New York and London: The Macmillan Co., New York.* xvi + 1305 pp. (B.) Price: £10, 10s.—It is impossible to review a thirteen hundred page book which has taken its author a decade to write and which has involved him in the study of some 7000 original papers. As with the same writer's *The Avian Egg*, one can only be grateful for this labour of love which has brought so much information into reasonable campass. One must also be especially pleased that the older, descriptive studies have been given their proper place and that they are frequently used as the basis of the 426 new illustrations. It is refreshing indeed to find a diagram based on descriptions made eighty or so years apart, and it is to be hoped that the student, fed on a diet of the most up--to-date, will appreciate the significance of this.

After three chapters on the germ cells, fertilisation and early morphogenesis respectively, the book goes over the development of each organ system in individual chapters, and finishes with a chapter on the extraembryonic membranes. Most of the text is descriptive and based inevitably on *Gallus gallus*, but differences among other bird species are emphasised. One cannot call the book selective, for with Romanoff selection means including anything relevant! Consequently, there is a great deal of somewhat esoteric information scattered throughout the pages. For instance, data are quoted giving the mitotic indices of liver cells cultured in extracts from embryos of different ages. Those acquainted with the *The Avian Egg* will already know that this is the book to consult for such out of the way information, or for such facts, for example, as when the islets of Langerhans are first identifiable in the developing pancreas. Again, where experimental manipulation has been able to throw light on embryogenesis, the relevant reference is given. However, it is perhaps in this experimental area that the book seems weakest, since no attempt is made at judgments between experiments. In these days, when data tend to be forced more and more into somewhat rigid conceptual frameworks, this neutrality may be an advantage, provided the reader goes back to the original papers and

forms his own opinion. The balance between the chapters is also not quite as one might expect, but this is a consequence of the encyclopaedic approach which, in places, has led to a flatness of style which betrays the enthusiasm of the preface. The book concludes with an appendix tabulating weights of embryos and their parts during development.

The bibliography covers about 3000 papers, ranging from the 4th century B.C. to 1955-6, and is conveniently cross-referenced to the pages of the text. The index also contains about 3000 entries and proved more than adequate for the subjects checked. With its predecessor, this volume therefore forms an encyclopaedia on the egg and its development: but like all encyclopaedias it must be used with discretion. It is unlikely that anyone will again be able to construct such a suitable memorial to their interests and labours in this field, if only because the book under review should stimulate a great expansion of work on the avian embryo.—J. H. Sang. (Animal Breeding Abstracts)

SCHAAF, A., and **WENDT, H.** 1959. (Inst. TierzForsch., Dtsch. Akad. LandwWiss., Dummerstorf, Berlin.) Die Winterlegeleistung als Massstab fur die zu erwartende Jahresleistung von Legehennen im ersten Legejahr und als Basis fur zuchterische Massnahmen.

WINTER EGG PRODUCTION AS A CRITERION FOR EXPECTED ANNUAL PRODUCTION IN THE PULLET YEAR AND AS A BASIS FOR SELECTION. *Arch Tierz.*, 2: 245-266. (Russian and English summaries.)—Data were obtained from the records of 2023 hens at State Laying Trials from 1st Oct. 1954 to 15 Sep. 1957. Annual production averaged 203.7 eggs, of which 35.8% were laid in winter. Coefficients of correlation between winter laying and annual production increased from 0.571 when winter production was based on production to the end of Dec., to 0.657 and 0.726 when it was extended to the end of Jan. and Feb. resp. Similar coefficients calculated on the basis of 211 sister-groups were 0.648, 0.700 and 0.765. Calculated on data for 873 White Leghorns and 734 Brown Leghorns, the heritabilities of production from Oct. to the end of Dec. were 0.38 and 0.40 resp., from Oct. to the end of Jan. 0.43 and 0.40 and from Oct. to the end of Feb. 0.41 and 0.50; those for production in the laying year were 0.25 and 0.37 resp. It is concluded that selection of the breeding flock on the basis of winter egg production would reduce the generation interval. (Animal Breeding Abstracts)

SCHEIN, M. W., and **E. B. HALE.** 1959. (Dep. Poult. Husb., Pennsylvania State Univ., University Park.)

THE EFFECT OF EARLY SOCIAL EXPERIENCE ON MALE SEXUAL BEHAVIOUR OF ANDROGEN INJECTED TURKEYS. *Anim. Behav.*, 7: 189-200.—Precocious ♂ sexual behaviour was induced in White Holland turkey poults of both sexes by daily injections of 1 mg. testosterone propionate. In order to study the effect of different social experiences on the birds, they were either (1) grouped, (2) grouped and then isolated, or (3) isolated *(i.e.* from visual and tactual stimulation from other birds). The type of response (escape, avoidance, no response, strutting, copulatory movements) of poults of the 3 groups to a poult head, a poult body, the human hand, and various inanimate objects was noted. Many birds were observed to strut in the absence of specifically presented stimuli. Isolated birds more often strutted openly in the presence of the observer than did grouped birds. Qualitatively, the reaction of a bird to a stimulus situation was generally consistent from test to test, the grouped poults being the most variable. There was no evidence of a gradual maturation of sexual behaviour with reported testing. Rearing conditions to 10 days of age had a marked effect in determining the stimuli that released sexual behaviour. Isolated birds responded mainly to the observer's hand, whereas all but one of the reacting group-reared birds responded to the head model. No bird responded preferentially to the headless body. Courtship display was observed in 85% of ♂ ♂ but only 26% of ♀ ♀ subjected to androgen treatment; 46% of the ♂ ♂ and only 13% of the ♀ ♀ attempted copulation. The frequency of "copulatory behaviour" was highest in the grouped-isolated poults and lowest in the grouped poults. There is,

however, a strong possibility that transient test conditions rather than prolonged differential social experiences were the primary factors contributing to the behavioural response to the various stimulus objects. (Anmial Breeding Abstracts)

SIBLEY, C. G. 1960. (Cornell Univ., Ithaca, N.Y.)
THE ELECTROPHORETIC PATTERNS OF AVIAN EGG-WHITE PROTEINS AS TAXONOMIC CHARACTERS. *Ibis*, 102: 215-284. (B.)—Several hundred avian species, including ducks and fowls, were studied. No important breed differences were found in the egg-white protein profiles of the domestic fowl *(cf. A.B.A.*, 27, No. 2073); the profiles of the wild mallard and the Pekin duck were also essentially similar, indicating that selection for external morphological characters does not necessarily affect the basic protein structure. When 2 species were closely enough related to produce hybrid ♀ offspring capable of oviposition, the egg-white protein profiles of the parents were found to be identical or almost identical; however, species with identical egg-white profiles are not necessarily capable of interbreedng. (Animal Breeding Abstracts)

SIEGEL, H. S. 1959. (Virginia Polytech. Inst., Blacksburg.)
EGG PRODUCTION CHARACTERISTICS AND ADRENAL FUNCTION IN WHITE LEGHORNS CONFINED AT DIFFERENT FLOOR SPACE LEVELS. *Poult. Sci.*, 38: 893-898.—Total egg production was significantly lower in groups of White Leghorn pullets confined at 1.33 $ft.^2$ per bird for 196 days than in those confined at 4.00 $ft.^2$ per bird for the same period. Eggs per bird laying and mean cycle (clutch) length were significantly reduced in more densely populated groups, but the number of birds laying per group was not. Although adrenal hypertrophy, indicative of mild physiological stress, was observed in the 1.33 $ft.^2$ groups, this could not be correlated with egg production factors.—Author's summary. (Animal Breeding Abstracts)

SMITH, A. H., S. A. COURT, and **E. W. MARTIN.**
FORMATION OF ALBUMEN PRECURSORS BY THE HEN'S OVIDUCT. *Amer. J. Physiol.*, 1959, 197, 1041-1044. (Dept. Poultry Husb., Univ. California, Davis.)—The chemical composition of the magnum of hens was studied before and after laying and in non-laying hens. The quantity and composition of the material accumulated in the magnum after deposition of albumin, with and without subsequent ovulation, showed that albumin precursors are formed in at least 2 stages. The discrepancy between the quantity of material accumulated in the magnum and that deposited in the egg showed that a fairly large part of the albumin dry matter, about 45 per cent., must be formed very rapidly during deposition or shortly thereafter.—G. F. Garton. (Nutrition Abstracts & Reviews)

SMOCZKIEWICZOWA, A.
SODIUM, POTASSIUM, CALCIUM AND CHLORIDE ION CONTENTS AND PROTEIN FRACTIONS IN THE FLUIDS OF CHICK EMBRYOS. *Nature*, 1959, 183, 1260-1261. [Inst. Inorg. Aanal. Chem. Med. Acad., Poznan.]—In the developing chick embryo Na and Cl in the amniotic fluid decreased but K increased greatly after 14 days. Values in m-equiv. after 12 and 14 days were Na^+ 130, 112; K^+ 4.7, 21.8; Ca^{2+} 2.1, 4.7 and Cl^- 141, 108. Corresponding values for allantoic fluid were 110, 84; 13.0, 25.0; 2.0, 1.5 and 90, 72. Protein in amniotic fluid increased simultaneously with K from about 0.5 to about 10 g. per 100 ml. and the fractions in the electrophoretic diagram changed from 3 to 5. Residual protein of incubated eggs after 11 and 13 days was electrophoretically similar to the concentrated amniotic fluid.—A. Hepburn. (Nutrition Abstracts & Reviews)

SQUIBB, R. L., G. N. WOGAN, and **C. H. REED.**
PRODUCTION OF WHITE LEGHORN HENS SUBJECTED TO HIGH ENVIRONMENTAL TEMPERATURES WITH WIDE DI-

URNAL FLUCTUATIONS. *Poultry Sci.*, 1959, 38, 1182-1183. (Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.) (Nutrition Abstracts & Reviews)

STAMLER, J., R. PICK, and **L. N. KATZ.**
SATURATED AND UNSATURATED FATS. EFFECTS ON CHOLESTEROLEMIA AND ATHEROGENESIS IN CHICKS ON HIGH-CHOLESTEROL DIETS. *Circulation Res.*, 1959, 7, 398-402. (Cardiovasc. Dept., Med. Res. Inst., Michael Reese Hosp., Chicago, Ill.) Interlingua summary.—Different oils and fats were added to a stock diet containing from 0.5 to 2.0 per cent. cholesterol for groups of young cockerels. Between groups given from 5 to 10 per cent. of polyunsaturated oils and fats, including cottonseed, linseed or maize oil or linoleic acid, there was no significant or consistent difference in food intake, weight gain, serum cholesterol value or incidence of atheromatous change in aorta or coronary vessels. In birds given 10 per cent. of fat or oil high in mono-unsaturated oleic acid, such as oilve oil, chicken fat or Neofat (Armour Labs.), or oleic acid itself, the serum cholesterol value was generally lower than with an equivalent amount of cottonseed oil. With saturated fat or oil such as lard, butter, egg yolk or coconut oil the incidence of atheromatous changes and the raised blood cholesterol were like those found with cottonseed oil. Increasing the percentage of maize oil to 20 from 5 to 10 per cent. led to an increase in serum cholesterol and in the incidence of atherosclerosis. Linoleic acid had no protective action in a diet containing egg-yolk mash, and the high blood cholesterol and the incidence of atherosclerosis were not changed by substituting 10 per cent. maize oil for 10 per cent. butter.—L. Wills. (Nutrition Abtracts & Reviews)

STILES, P. G., and **L. E. DAWSON.** 1959. (Dep. Poult. Sci., Michigan State Univ., East Lansing.)
THE RELATIONSHIP OF OVIPOSITION TIME CLUTCH POSITION, BAROMETRIC PRESSURE, AND EGG WEIGHT TO THE INCIDENCE OF BLOOD SPOTS IN EGGS. *Poult. Sci.*, 38: 586-589.—Normal eggs were compared with eggs containing blood spots to determine if differences existed regarding the time of oviposition in the clutch, and egg weight. A comparison was made on the incidence of blood spots at different barometic pressure levels. In comparing normal and blood spot eggs of a similar clutch position, it was found that the mean av. oviposition time of eggs containing blood spots occurred approx. 30-50 mins. sooner than in normal eggs. A higher incidence of blood spots was found in the 1st egg of a clutch than in succeeding clutch positions. No correlation was found between the barometric pressure or net changes in pressure for the area and the incidence of blood spots in eggs laid 24 or 48 hrs. later. The mean av. weight of eggs containing blood spots was found to be significantly greater than the mean av. weight of normal eggs, when comparisons were made between eggs of the 1st clutch position, and when all of the eggs were compared disregarding clutch positions. This difference was approx. 1.5 g.—Authors' summary. (Animal Breeding Abstracts)

SUNDE, M. L., and **H. R. BIRD.** 1959. [Dep. Poult. Husb., Coll. Agric., Univ. Wisconsin, Madison.]
THE EFFECT OF PULLET MATURITY ON FERTILITY AND HATCHABILITY OF EGGS. *Poultry Sci.*, 38: 272-279.—Eggs laid by Single Comb White Leghorn pullets that had just reached sexual maturity did not hatch well, showed low fertility, and had a high incidence of mortality during the 1st wk. of incubation (16% of fertile eggs in one instance) with a high av. percentage (29½%) during the first 24 hrs. Hatchability and fertility were normal after 2 mths.' egg production, the av. incidence of early deaths dropping to 5% of fertile eggs. No advantage was evident from feeding special diets. (Animal Breeding Abstracts)

SVOBODA, A. 1959. [Vet. Fac., Agric. Coll., Kosice.] K otazke zvysovania zivotnosti a uzitkovosti sliepok aplikaciou cudzorodej krvi.
INCREASED VITALITY AND PRODUCTION IN FOWLS BY THE ADMINISTRATION OF BLOOD OF ANOTHER SPECIES. *Pol'nohospodarstvo [Bradislava]*, 6: 45-50. [Russian and German summaries.]—Blood of Pekin ducks, or of White Leghorn or Rhode Island fowls, was subcutaneously injected into White Leghorn chicks within a week of hatching. Growth and development were greater in the chicks injected with the blood of Pekin ducks than in untreated controls or in the chicks injected with fowl blood.—Abstract of summaries. (Animal Breeding Abstracts)

SYKES, A. H. 1959.(Dep. Vet. Physiol., Univ. Liverpool.)
EGG FORMATION IN THE HEN. *New Biol.*, No. 30: 7-24.—A general account of the process of egg formation in the hen, including sections on the pattern of egg production, internal mechanisms, and the hormonal control of reproductive functions. (Animal Breeding Abstracts)

TAKAHASHI, K., T. NAKAJIMA, and **S. KANAKI.**
HISTOPATHOLOGICAL STUDIES OF THE LIVER, KIDNEY AND THYMUS OF CHICK EMBRYOS ADMINISTERED WITH HYDROXYMETHYLPYRIMIDINE. *J. Vitaminol., Japan*, 1959, 5, 178-187. (Dept. Pharmacol., Showa Med. Sch., Shinagawa, Toyko.)—White Leghorn eggs had injected into them 2-methyl-4-amino-5-hydroxymethylpyrimidine, or pyridoxine, or both. Embryos were removed at intervals and the changes in liver, kidney and thymus are described. There was temporary deposition of fat in liver in all groups, but those with the pyrimidine showed also necrosis and dilatation of the capillaries. There were abnormal findings in kidney and thymus with the pyrimidine, but the thymus was not atrophic.—I. Leitch. (Nutrition Abstracts & Reviews)

TANAKA, K. and **S. NAKAJO.**
CHOLINESTERASE IN THE DIENCEPHALON OF THE HEN IN RELATION TO EGG LAYING. *Poultry Sci.*, 1959, 38, 991-995. (Lab. Animal Breeding, Fac. Agric., Nagoya Univ., Anyzo, Japan.)—Cholinesterase was estimated manometrically in the diencephalon of non-laying and of laying hens. Ranges of CO_2 production from acetylcholine in μl. per mg. fresh tissue per hr. were: non-laying hen 15 to 21; 2 hr. before laying, with hard-shelled egg in uterus, 18 to 21; just before laying 21 to 25; after laying 22 to 25; before ovulation 14 to 19; egg in infundibulum 16 to 21; egg in anterior magnum 22 to 27; egg in posterior magnum 18 to 21; egg in isthmus 19 to 23; egg in uterus at night 22 to 26. Injection of oxytocin to induce premature laying reduced cholinesterase, and irritation of the anterior magnum of the oviduct increased it when the ovary had large follicles.—J. S. Thomson. (Nutrition Abstracts & Reviews)

TSUKUNAGA, S., and **TAKAHASHI, T.** 1959. (Hiroshima Agric. Coll.)
EFFECTS OF THYROID-STIMULATING AND THYROID- INHIBITING SUBSTANCES UPON THE GROWTH OF COCKERELS. *Bull. Hiroshima agric. Coll.*, 1 (2): 34-39. (Japanese with English summary.) Abstract in *Biol. Abstr.*, 1960, 35, No. 16386, copied *verbatim*.—The administration of methylthiouracil, 10-30 mg., to 7-wk-old cockerels caused significant hypertrophy of the thyroid gland while the administration of comparable dosages of a desiccated thyroid preparation caused atrophy of the glandular tissue. Neither drug had a specific effect on normally developed testicular tissue. In the case of undeveloped testes, some spermatogenic disturbances including desquamation of epithelia and formation of polynuclear cells were observed. Neither drug showed any effect on the development of the comb or on increasing the live weight or dressing percentage of birds. Implications of these results are discussed. (Animal Breeding Abstracts)

URIST, M. R.
THE EFFECTS OF CALCIUM DEPRIVATION UPON THE BLOOD, ADRENAL CORTEX, OVARY, AND SKELETON IN DOMESTIC FOWL. *Recent Progr. in Hormone Res.*, 1959, 15, 455-481 [Dept. Surg., Div. Orthopaed., Univ. California, Los Angeles.] (Nutrition Abstracts & Reviews)

VAINIKAINEN, V. 1957. (Agric. Exp. Sta., Tikkurila.) Kanojen elopainon seka niiden munien painon kehityksesta muninta-aikana.
THE DEVELOPMENT OF LIVE WEIGHT OF HENS AND WEIGHT OF EGGS DURING THE LAYING SEASON. *Maatalous ja Koetoim.*, 11: 24-28. (German summary.)—Forty-four pullets were weighed weekly from the start of the laying season for a period of about 6 mths., to the end of March, and an increase of weight of 280 g. occurred, which amounts to 16% body weight. It was established that on the basis of initial weighing the final weight of birds could be estimated wth 80% accuracy. During the period the weight of the first egg averaged 48.5 g., and that of the tenth egg 52.3 g. Egg weight increased until March, when the av. weight was 57.2g. It was possible to forecast the weights of eggs of individual birds in March from the weights of the first, 2, 4, 8, and 16 eggs, with an accuracy of 44%, 54%, 66%, 71% and 78% resp.—From German summary. (Animal Breeding Abstracts)

VANDEPUTTE-POMA, J., and G. VAN GREMBERGEN. Freie Aminosaure in der Kropfmilch der Taube.
FREE AMINO ACID IN PIGEON'S CROP MILK. *Naturwissenschaften*, 1959, 46, 329. [Lab. Zoophysiol., Univ. Ghent.]—In a series of tests by paper chromatography lysine, serine, glutamic acid, alanine, valine, lucine and phenylalanine were always found in pigeon's crop milk; cysteine, glycine, arginine, threonine, methionine and *iso*leucine were often present and aspartic acid, proline and tyrosine were each found only once. The N content of free amino acids was about 17 per cent. of the total N.—R. G. Hankin. (Nutrition Abstracts & Reviews)

VAN TIENHOVEN, A. 1960. (Cornell Univ. Agric. Exp. Sta., Ithaca, N.Y.)
THE METABOLISM OF FOWL SPERM IN DIFFERENT DILUENTS. *J. agric. Sci.*, 54: 67-80.—Dilution of fowl semen with phosphate or saline diluents depressed respiration, while dilution with seminal plasma did not affect respiration. Dilution with Tyrode solution resembled dilution with seminal plasma with respect to respiration. The effect of Tyrode solution seemed to be mainly due to its $NaHCO_3$ content.
The effect of Ca, Mg and K ions depended on the anions in the diluents. Phosphate depressed respiration and glycolysis when it replaced saline in the Tyrode diluent.
Dilution did not consistently increase respiration and in most cases depressed respiration.
Fowl sperm preferentally utilised glucose when glucose and fructose were initially present in equal concentration in the diluent. The sperm metabolise glucose at a faster rate than fructose. No evidence was found for the formation of glucose from fructose under our experimental conditions.
Initial respiration and glycolysis of fowl semen was depressed by the addition of glycine to the Tyrode diluent. However, the glycine addition resulted in a less sharp decrease in the hourly respiration rate. —Author's summary. (Animal Breedng Abstracts)

VLADIMIROVA Ju N. 1958. Povysenie ziznennosti zarodysei pod vlijaniem periodiceskih podogrevanli i ohlazdenii gusinyh jaic.
INCREASING EMBRYONIC VIABILITY BY PERIODIC HEATING AND COOLING OF GOOSE EGGS. *Trud. vsesojuz. nauc.-issled. Inst. Pticev.*, 25: 209-221.—At the Davydov Hatchery in Voronezh Province, eggs from Kholmogor geese were heated and then cooled for various periods while holding for 10, 15 or 20 days before incubation; unheated eggs served as controls. When the eggs were heated for 2 hrs. every 2nd day, hatchability was increased over that of the controls.

The difference was greatest when the eggs were held for 20 days, and greater when they were held for 15 days than when they were held for 10 days. Differences were increased by heating only 4 times, the duration of heating being progressively increased from 1 to 4 hrs. Heating once for 5-7½ hrs. also increased hatchability over that of the controls. (Animal Breeding Abstracts)

VLADIMIRSKAJA, E. M. 1958. [Ukrainian Acad. Agric. Sci., Kiev.] Konservirovanie polovyh zelez u ptic kak sposob predvariteljnoi obrabotki ih pered peresadkoi v organizm recipienta.

PRESERVATION OF THE GONADS OF BIRDS AS A PRELIMINARY MEASURE BEFORE TRANSFER TO A RECIPIENT. *Bjull. eksp. Biol. Med.*, 46(12): 78-81. [English summary.]—A total of 152 Leghorns, Australorps and New Hampshires aged 15 days to 2½ months was used. The gonads were removed, placed in a fluid for 2-3 days at a temp. of +3° C. and then transferred to recipients of the same sex and breed as the donors. After transfer, 47.1% of the gonads preserved in allantoic fluid and 43.8% of those preserved in amniotic fluid developed *v.* 27-31% of those preserved in aqueous humour or blood serum, or at low temp. without any medium; 21.1% of the gonads transferred without previous treatment developed. (Animal Breeding Abstracts)

WALES R. G., and **I. G. WHITE.** 1958. (Dept. Vet. Physiol., Univ. Sydney.)

THE INTERACTION OF *p*H, TONICITY, and ELECTROLYTE CONCENTRATION ON THE MOTILITY OF FOWL SPERMATOZOA. *Aust. J. biol. Sci.*, 11: 177-186.—The motility of fowl spermatozoa has been studied *in vitro* under various modifications of *p*H, osmotic pressure, and chemical composition of diluents. The glucose and sodium chloride content of the diluents has been varied to give tonicities ranging between that of 0.45 and 1.8% sodium chloride. These diluents were buffered with citric acid-disodium phosphate, sodium phosphates, or sodium carbonate-bicarbonate mixtures which were equally innocuous. Fowl spermatozoa showed maximum motility at *p*H 7 and the *p*H of fowl semen was 7.6 ± 0.42. At a *p*H of 8.7-8.9 partial replacement of sodium chloride by glucose was favourable in hypotonic, isotonic, and hypertonic diluents. Under all conditions hypotonic diluents were more deleterious than hypertonic ones of similar composition and the spermatozoa were able to partially adapt themselves to exterme osmotic pressures.—Authors' summary. (Animal Breeding Abstracts)

WHARTON, F. D. (Jr.), J. C. FRITZ, R. B. SCHOENE, and **M. J. SMIDT.**

THE EFFECT OF PARAAMINOBENZOIC ACID ON THE TOXICITY OF 3-NITRO-4-HYDROXYPHENYLARSONIC ACID IN CHICKS AND POULTS. *Amer. J. Vet. Res.*, 1959, 20, 655-658. [Dawe's Laboratories, Inc., Chicago, Ill.]—Chicks 4 weeks old, average weight 400 g., were maintained on adequate rations. Three days after injection of 3-nitro-4-hydroxyphenylarsonic acid, 100 or 200 mg. per kg. body weight, percentage survival was 65 and 2, and average survival time of those dying 1.99 and 1.53 days; when an equal amount of *p*-aminobenzoic acid was given ½ hr. before the arsonic acid, percentage survival was 56.6 and 17.5 and average survival time 2.81 and 1.64 days. Chicks given arsonic acid with or without *p*-aminobenzoic acid lost weight; those given *p*-aminobenzoic acid alone all survived and gained weight. In one trial when the sex of the chicks was known, a slightly higher percentage of males survived. In a trial when chicks were given 1 g. N-carbamyl-arsanilic acid all survived and gained weight with or without *p*-aminobenzoic acid.

In trials with turkey poults no deaths occurred and satisfactory weight gains were made with up to 40 mg. arsonic acid per kg. bodyweight with or without previous administration of *p*-aminobenzoic acid in equal amounts. Weight gains were much less when 50 or 80 mg. per kg. was given with or without *p*-aminobenzoic acid. and at these levels of intake 4 of 20 and 2 of 30 died.—R. G. Hankin. (Nutrition Abstracts & Reviews)

WILCOX, F. H. 1959. (Dep. Poult. Husb., Univ. Maryland, College Park.) THE EFFECT OF DIFFERENT HYDROGEN ION CONCENTRATIONS DURING STORAGE AND AT INSEMINATION AND OF ADDED MAGNESIUM AND POTASSIUM ON THE FERTILIZING ABILITY OF CHICKEN SEMEN. *Poult. Sci.*, 38: 1159-1161.—Sodium phosphate buffers of *p*H 6.5, 7.2, and 7.8 were used in diluting chicken semen for storage and for resuspension of centrifuged semen after storage. There was no apparent effect of *p*H within the range employed. Addition of MG^{++} and K^{+} just before insemination to the buffer solutions containing fructose was likewise without effect.—Authors's summary. (Animal Breeding Abstracts)

WILCOX, F. H. 1959. EFFECT ON THE ADDITION OF CARBOHYDRATES AFTER STORAGE ON THE MOTILITY AND FERTILIZING ABILITY OF CHICKEN SPERM. *Poult. Sci.*, 38: 1162-1168.—Cock semen has been stored for extended periods of time in a sodium phosphate buffer containing antibiotics and subsequently resuspended with buffer containing various levels of fructose or various other carbohydrates. There was found to be little difference in the fertility obtained at fructose levels varying from 0.25 to 8 mg./ml. although fertility was slightly lowered at a level of 16 mg./ml. Motility of the resuspended sperm was markedly enhanced by the addition of glucose, fructose, mannose, galactose and fructose 1-6-diphosphate, but was not improved upon addition of any of the pentoses and dissacharides used. Fertiltiy was improved upon addition of all of the hexoses studied. ATP (adenosine triphosphate) reduced motility slightly at the higher levels used. Addition of phosphate buffer containing fructose was found to have little if any effect on fertility of fresh sperm. Centrifugation had little effect on fertility at 2 different forces.—Author's summary. (Animal Breeding Abstracts)

WILCOX, F. H. 1959. (Dep. Poult. Husb., Univ. Maryland, College Park.) BLOOD *p*H AND SEX RATIO IN CHICKENS. *Poult. Sci.*, 38: 959-964.—Acid and alkaline salts were added to the diets of White Leghorns and Rhode Island Reds to alter the *p*H of the blood and determine whether the sex ratio of the offspring would be affected. Blood *p*H had no effect on sex ratio as determined at hatching or 18 days of incubation. Except at 5.9% Na_2CO_3 and 3.8% NaOH (the highest levels used), there appeared to be little effect on mortality or egg production. (Animal Breeding Abstracts)

WILCOX, F. H. 1960. (Univ. Maryland, College Park.) STUDIES OF THE PHYSIOLOGICAL BASIS(ES) FOR DIFFERENCES IN SERUM ALKALINE PHOSPHATE LEVEL OF TWO LINES OF WHITE LEGHORNS. *Fed. Proc.*, 19: 192. (Fed. Amer. Soc. Exp. Biol. meeting abstract.) (Animal Breeding Abstracts)

WOOD-GUSH, D. G. M. 1960. (Agric. Res. Coun. Poult. Res. Centre, Edinburgh.) A STUDY OF SEX DRIVE OF TWO STRAINS OF COCKERELS THROUGH THREE GENERATIONS. *Anim. Behav.*, 8: 43-53.—A population of 30 cockerels belonging to 6 sire families was tested for mating frequency and differences between the families were found to exist. The highest and lowest scoring ♂♂ were chosen to sire the F_1 generation. The sons of the high scoring ♂♂ (H.S. ♂♂) scored higher frequencies for mating activity than the sons of low scoring ♂♂ (L.S. ♂♂). Furthermore, the H.S. ♂♂ adapted themselves to ♀♀ in a significantly shorter time than the L.S. ♂♂.

An F_2 generation of H.S. and L.S. ♂♂ was bred following the same programme as that for obtaining the F_1 ♂♂. Half of the ♂♂ from each strain were allowed access to young ♀♀ from an early age, but this treatment did not affect the differences in mating frequency between the 2 strains; the H.S. ♂♂ were superior to the L.S. ♂♂ regardless of early experience.

In the P_1 and F_2 generations an inverse relationship between the size of the head appendages and mating frequency was observed. No

measurements were taken in the F_1 generation. The F_2 ♂♂ were subjected to a number of physiological tests which were capable of indirectly discerning any large differences in the endocrinal output of the birds. No such differences were apparent. The birds were also examined in a number of other behavioural traits, but mating frequency appears to be the major behavioural difference between the 2 groups.

The L.S. ♂♂ in the F_2 generation were better semen donors than the H.S. ♂♂, and this was also found in an F_3 generation. In this last generation it was found that the H.S. ♂♂ had more intromissions per ejaculate than the L.S. ♂♂. The significance of this finding is discussed. —Author's summary. (Animal Breeding Abstracts)

WYNE, J. W., R. D. CARTER, M. G. McCARTNEY, and **V. D. CHAMBERLIN.** 1959. (Dep. Poult. Sci., Ohio Agric. Exp. Sta., Wooster.)

RELATION OF TIME OF INSEMINATION TO FERTILITY IN THE TURKEY. *Poult. Sci.*, 38: 828-831.—On the 20th March 1958, 56 Large-type White turkey pullets were examined by digital palpation for the presence or absence of a hard-shelled egg in the uterus, and then ♀♀ of each category were inseminated with 0.025 cm.³ pooled semen at 9.00 a.m. 1.00 p.m., or 4.00 p.m. Fertility was examined over a 19-day period; in hens that were inseminated while a hard-shelled egg was present in the uterus there was a 12-18% decrease in fertility. When no hard-shelled egg was present in the uterus, fertility of the 1 p.m. inseminations was 88% *v.* 69% and 75% for the 9 a.m. and 4 p.m. inseminations resp. Two other trials were made in 1956 and 1958 with 150 Small-type White and 280 Large-type White turkeys resp. to determine the influence of a hard-shelled egg in the uterus at the time of insemination on subsequent fertility. A single insemination was made between 2 and 4 p.m. at the beginning of the breeding season and fertility examined during a 3-wk. period. Results again indicated that the presence of a hard-shelled egg in the uterus was detrimental to fertlity, but there was no tendency to complete infertility. In general, highest average fertility was obtained by insemination a 1 p.m. whether a hard-shelled egg was present in the uterus or not. (Animal Breeding Abstracts)

WYNE, J. W., R. D. CARTER, M. G. McCARTNEY, and **V. D. CHAMBERLIN.**

GROWTH AND FEED CONVERSION OF TURKEYS REARED ON RANGE AND IN CONFINEMENT. *Poultry Sci.*, 1959, 38, 1003-1005. (Dept. Poultry Sci., Ohio Agric. Exp. Stat., Wooster.)—Groups of male and of female Broad Breasted Bronze and Large White turkeys were brooded to 8 weeks on the same ration and were then reared to 24 weeks on an adequate pelleted ration either in confinement in a pole shelter or on ladino clover range.

Average weights in lb. at 24 weeks for birds reared on range and in confinement, respectively, were: Bronze males 22.4 and 20.6; Bronze females 14.2 and 14.3; White males 20.0 and 18.9; White females 12.6 and 12.4 Differences in weight between the sexes and varieties and, in the males, between methods of rearing were highly significant. Differences in average efficiency of feed conversion were significant for sex only, efficiencies being 4.6 and 4.2 lb. feed per lb. gain for females and males, respectively. Method of feeding had no effect on efficiency.—J. S. Thomson. (Nutrition Abstracts & Reviews)

XUMSAI, M. L. S. 1959. (Kasetsart Univ., Bangkhen, Bangkok, Thailand.)

LIQUID EGG ALBUMEN, AN EFFECTIVE DILUTER OF FOWL SEMEN FOR ARTIFICIAL INSEMINATION. *World's Poult. Sci. J.*, 15: 250-254.—Because of the low av. fertility (60%) of eggs at the College Hatchery from 1953 to 1958, experiments were held to compare the saline solution normally used as a diluent with liquid egg albumen, which was known to maintain sperm motility for longer periods. A flock of 450 S.C. White Leghorns in their 2nd laying year was inseminated twice a week with 0.1 cm.³ semen diluted 1 : 1. Over a 10-day period fertility increased from 13.6 and 19.7% with saline to 61.0 and 50.2% with liquid egg albumen, over a 2-wk. period. In a 2nd experiment, a

flock of 94 Rhode Island Red pullets was inseminated with White Leghorn semen diluted with liquid albumen; fertility was 94.3% during the 1st week, 95.8% during the 2nd, and 82.9% during the 3rd. With this diluent it was found that insemination need only be carried out once a week instead of twice, as was the usual practice in the University. (Animal Breeding Abstracts)

YAMAMOTO, K., and **T. HOSODA.** 1957. [Fac. Agric., Univ. Tokyo.]
THE SENSITIVITY OF THE CHICKEN TO SYNTHETIC OESTROGEN AS DETERMINED BY VITELLIN PRODUCTIVE CAPACITY. *Jap. J. Breed.*, 7: 119-124. [Japanese with English summary.] From abstract in *Biol. Abstr.*, 1959, 33, No. 45079.—White Leghorns produced by sib matings were injected intramuscularly with a solution of 50 mg. stilboestrol in 20 $cm.^3$ sesame oil in daily amounts of 0.425 mg. for 10 days, starting on the 61st day after hatching. Strain differences were observed in oestrogen sensitivity, as judged by the serum vitellin reaction. There was a significant positive correlation between oestrogen sensitivity and age at 1st egg (0.527 in the 1st generation and 0.619 in the 2nd. (Animal Breeding Abstracts)

YAMAMOTO, K. 1959. (Univ. Tokyo.)
THE SENSITIVITY OF CHICKEN CONCERNING VITELLIN PRODUCTION CAPACITY TO THE INJECTION OF SYNTHEIC OESTROGEN. II. THE SEGREGATION OF STRAINS AND THE DEGREE OF LIKENESS WITHIN FULL BROTHERS AND SISTERS CONCERNING THE STRENGTH OF SENSITIVITY. *Jap. J. Breed.*, 9: 109-112. (Japanese with English summary.) From abstract in *Biol. Abstr.*, 1960 35, No. 17873.—Breeding experiments were carried out to determine whether a strain of fowl sensitive to administered oestrogen and a strain non-sensitive to oestrogen could be developed. In 3 successive generations of brother-sister matings, the sensitive group showed higher percentages of positive reactions than the non-sensitive group. The difference was more significant in the 3rd than in the 1st generation. As judged by the serum vitellin reaction, ♀♀ appeared to be more sensitive than ♂♂. (Animal Breeding Abstracts)

YESAIR, D. W., J. GOLDSTEIN, and **L. J. DANIEL.**
THE EFFECT OF VITAMIN B_{12} ON THE BLOOD SERUM PROTEIN AND LIPOPROTEIN IN THE DEVELOPING CHICK EMBRYO. *Arch. Biochem. Biophys.*, 1959, 84, 316-323. (Dept. Biochem. Nutrit., Cornell Univ. Ithaca, N.Y.)—Twelve hens were given for 4 weeks a diet deficient in vitamin B_{12} and another group of 12 hens the same diet with 9 μg. vitamin B_{12} per lb. diet. The hens were then inseminated artificially and the eggs were incubated. Living embryos were taken from eggs at 12, 15, 18 and 21 days of age and blood was removed by heart puncture. Serum lipoproteins and serum proteins were separated by paper electrophoresis. From 12 to 18 days of age total protein and proportions of the fractions were similar for both deprived and non-deprived chicks. At 21 days total protein and β-globulin were reduced in the serum of deprived chicks. Total serum lipid increased between 12 and 18 days in both normal and deprived embryos. The fraction which included chylomicron and β-lipoprotein lipid was at a maximum at 18 days and deprivation of vitamin B_{12} raised the proportion of that fraction at all ages. In both normal and deficient embryos α-lipoprotein was at a minimum at 15 days and thereafter increased to hatching. In the deprived chicks α-lipoprotein was less at all stages of development. Since it had previously been shown that phospholipids are synthesised in the chick embryo and that less phospholipid is present in the embryo deprived of vitamin B_{12}, it is suggested that the decrease of the lipoprotein fraction in deprived embryos may be the result of reduced synthesis of phospholipid.—A. Crossland. (Nutrition Abstracts & Reviews)

ZEREBCOV, P. I., and **G. V. FILATOV.** Obmen kal'cija u ptic v ontogeneze.
CALCIUM METABOLISM IN THE BIRD DURING ONTOGENESIS. *Izv. Timirjazev. Sel'skohoz. Akad.*, 1959, No. 4, 143-154.—This is partly a review, but includes some original work. With single doses of ^{45}Ca as $CaCl_2$ by mouth, in small amounts of carrier, it was found that in 24 hr. the percentage of the dose taken up in the first month of life was of the order of 90, with a fall to between 40 and 45 at 6 months. Excretion in the first 24 hr. was in the first month of life about 2.1 to 8 per cent. The peak of ^{45}Ca in the blood was reached after 1 to 3 hr. and activity had almost disappeared after 24 hr. The younger the chicken, the higher the peak. Uptake of ^{45}Ca and ^{32}P by different bones was studied in chickens of different ages and values are tabulated. In the tibiotarsus uptake of both isotopes was greatest at the distal end at 3 months of age, but at the proximal end at 5 to 6 months.—D. Duncan. (Nutrition Abstracts & Reviews)

ZIELINSKI, K. 1959. Wspolzaleznosc miedzy waga mlodek w okresie wzrostu i ich wczesnoscia dojrzewania. Biale Leghorny.
CORRELATION BETWEEN THE WEIGHT OF PULLETS DURING THE GROWING PERIOD AND THEIR AGE AT SEXUAL MATURITY. WHITE LEGHORNS. *Roczn. Nauk rol., B*, 74: 363-374. (Russian and English summaries.)—Early sexual maturity was found to be correlated with higher body weights during the growing period. The relationship between age at 1st egg and absolute body weight was most evident at 60 and 90 days of age ($r = -0.4229$ and -0.4402 resp.). The correlations between hatching weight and age at 1st egg ($r = -0.1150$) and between final weight and age at 1st egg ($r = -0.0600$) were not statistically significant. (Animal Breding Abstracts)

ZUBAREVA, L. A., and **Z. M. SPITKOVSKAJA.** 1958. Nekotorye osobennosti interjera pomesnyh kur.
CERTAIN CHARACTERISTICS OF THE INTERIOR OF CROSSBRED FOWLS. *Trud. Inst. Genet. (Mosk.)*, No. 24: 340-351.—In 1955 purebred Russian White and Pervomai cockerels, and crossbred cockerels produced by Russian White hens and New Hampshire or Pervomai cocks were slaughtered at 3 or 5 mths. and the thyroid and testes were examined histologically. At 3 and at 5 mths. testes weight was greatest in the crossbreds sired by the Pervomais, not appreciably different in those sired by N.H.s and in Russian Whites, and least in Pervomais. At 5 mths. spermatozoa represented 31.66% of the sperm cells in the testes of the Pervomai crossbreds and 24.4 and 16.7% in those of the Russian Whites and N.H. crossbreds resp.; only the early stages of sperm development were noted in the Pervomais. (Animal Breeding Abstracts)

NUTRITION

ALLEN, K. A., J. STEPHENS, W. P. JAFFE, and **J. A. WAKELAM.**
UNIDENTIFIED GROWTH FACTORS.
WAKELAM, J. A., and **W. P. JAFFE.**
UNIDENTIFIED CHICK GROWTH FACTORS. *Nature*, 1959, 184, Suppl. No. 5, 271-272; 272. (Distillers Co. Ltd., Res. Development Dept., Great Burgh, Epsom.)—(a) In the duodenal contents of chickens supplements of either penicillin or malt distiller's dried solubles caused a shift in the balance of the bacterial flora in favour of a lactobacillus type. The change was thought to be due to suppression of other types of micro-organisms by penicillin and to stimulation of lactobacilli by the solubles. Experiments *in vitro* confirmed that the solubles acted as a growth factor for the lactobacilli. Stimulation of growth of the organisms was obtained also with molasses distiller's dried solubles, dried whey and dried yeast. The increase in lactobacillus types produced by either of the solubles tested was about 100-fold. The microbiological test *in vitro* could be used to assess these growth factors.
(b) Fishmeal, dried brewer's yeast, dried whey and molasses dis-

tiller's dried solubles were shown to have a growth-stimulating effect in microbiological tests. In trials with chickens on a purified ration they all significantly improved growth to 4 weeks, but when the results were recalculated to a constant feed intake the growh response to fish-meal disappeared.—T. D. Bell. (Nutrition Abstracts & Reviews)

AMERIKANISCHE MASTFUTTER-REZEPTUREN.
AMERICAN RATIONS FOR FATTENING [POULTRY]. *Deutsch. Wirtschaftsgeflugelzucht*, 1959, 11, 692. (Nutrition Abstracts & Reviews)

ANDERSON, J. O. and **D. C. DOBSON.**
AMINO ACID REQUIREMENTS OF THE CHICK. 2. EFFECT OF TOTAL ESSENTIAL AMINO ACID LEVEL IN THE DIET ON THE ARGININE AND LYSINE REQUIREMENTS. *Poultry Sci.*, 1959, 38, 1140-1150. (Poultry Dept., Utah State Univ., Logan.) For part 1 see Abst. 6756, Vol. 29.—2. Bodyweight gain was used as the criterion for nutritional adequacy in experiments with chickens which were fed to appetite on diets differing in and supplemented by different amino acids at different levels. It was shown that the arginine and lysine requirements of the chicken depend upon the total and the balance of essential amino acids and not on level of protein *per se*.—J. G. Gordon. (Nutrition Abstracts & Reviews)

ARTEMICEV, M. A. and **P. V. OGORODNIKOVA.** Kal'cievyjostatok pri proizvodstve biomicina—cennyj korm dlja pticy.
THE CALCIUM RESIDUE FROM BIOMYCIN PRODUCTION IS A VALUABLE FEED FOR POULTRY. *Pticevodstvo*, 1959, No. 10, 44-46.—Aurkorm 2 is a residue from production of biomycin (chlortetracycline), containing, per cent., $CaCO_3$ 61.3, $CaCl_2$ 18.7 and some 20 per cent. organic matter. It contains 5 to 15 mg. biomycin per g. and 4 mg. vitamin B_{12} per kg. At the rate of 30 mg. per head daily it increased egg yield of laying hens. It increased weight gains of chickens when given in doses rising to as much as 400 mg. daily at 41 to 60 days.—D. Duncan. (Nutrition Abstracts & Reviews)

BAINTNER, K., and **K. JELENITS.** Csibenevelesi kiserletek hazai riboflavin keszitmennyel.
REARING CHICKENS WITH HUNGARIAN RIBOFLAVIN PREPARATIONS. *Rep. Fac. Animal Husb., Hung. Univ. Agric. Sci.*, 1957, No. 2, 1-8. [Russian, German and English summaries.]—Yellow Hungarian chickens, 208, receiving little protein, were given riboflavin, 3 or 6 mg. per kg. feed. The larger amount of vitamin improved feed utilisation but not weight gain; the smaller amount had no effect. Riboflavin improved feed utilisation and weight gain of 228 Leghorn chickens getting plenty of protein. It was concluded that supplements of riboflavin were effective only if the feed contained adequate protein but little riboflavin. (From summaries.)—I. R. Anderson. (Nutrition Abstracts & Reviews)

BALLOUN, S. L., W. J. OWINGS, J. L. SELL and **R. E. PHILLIPS.**
ENERGY AND PROTEIN REQUIREMENTS FOR TURKEY STARTING DIETS. *Poultry Sci.*, 1959, 38, 1328-1340. (Iowa State Univ., Ames.)—A series of 5 experiments, extending over 3 years, was made with 2000 turkey poults of both sexes from day-old to 6 weeks of age. Energy and protein in the diets were adjusted by varying components of the mixture.

In the first experiment, when protein was increased from 23 to 26 per cent. in diets supplying 770, 880 and 975 Cal. productive energy per lb., weight at 6 weeks increased by 8 per cent. and when the protein was raised to 29 per cent. there was a further increase of 5 per cent. in gain. Efficiency of feed utilisation was improved only slghtly. Increase of energy content had little effect on weight gains but improved efficiency more when protein was higher. The greatest increase was 20 per cent., when 29 per cent. protein was given. The interaction of

protein with energy and the effect of energy level were statistically significant.

The second experiment used diets containing up to 1000 Cal. per lb. and up to 32 per cent. protein. Growth was better at 3 weeks of age with the higher protein levels in both sexes, but the greatest improvement was not obtained at the highest energy level. Protein and energy, but not their interaction, were significant in males. At 6 weeks males responded best to the diet with 900 Cal. and females to that with 1000. When protein rose to 28 per cent. gains in both sexes improved but above this level there was no further increase for either sex. Both protein and energy significantly influenced feed efficiency, which was best at the highest levels of both. Efficiency also increased with energy, independently of protein.

In the third experiment it was found that a ratio of Cal. productive energy per lb. to percentage protein of 31 : 1 was best when the diet had 30 per cent. protein and 33: 1-with 28 per cent. protein. The interaction of energy : protein ratio with sex was highly significant because of the greater response of females to increases in energy. At comparable energy levels little improvement in growth was obtained by increasing protein from 26 to 30 per cent., but energy increases at both levels of protein improved efficiency and weight gain. In this experiment energy was the chief determinant of efficiency and gain.

In the fourth experiment, in which 3 levels of protein and 4 of energy were used, the lowest level of protein, 24 per cent., was inadequate at 3 weeks of age, so that at this level raising the energy was less effective than at the 2 higher levels of protein. Thus there was a significant interaction between protein and energy at 3 weeks old. At 6 weeks 24 per cent. protein was more nearly adequate and at this age energy became more important. Increases gave improved weight gains at all levels of protein and there was no significant interaction between energy and protein. At both ages energy was the most importan factor in determining efficiency.

Experiment 5 showed that at 3 weeks of age there was a highly significant effect of increasing protein from 24 to 32 per cent. on weight gains of males; it was not quite significant for females. Energy increased weight gains in both sexes. This was significant for females, but not for males. At 6 weeks old increased protein significantly inceased weights in males but not significantly in females. There was no significant interaction between protein and energy at either age. At 6 weeks increasing energy from 800 to 900 Cal. at all levels of protein raised weight by 9 per cent.; beyond this level of energy the response was slight. Raising energy increased efficiency; protein had little effect on efficiency. Greatest efficiency was with the highest energy and protein although the interaction between protein and energy was not significant. Sex effects were not tested. The results are discussed.—J. G. Gordon. (Nutrition Abstracts & Reviews)

BAUMAN, V. K. Vlijanie organiceskih kislot silosa na mineral'nyj obmen i produktivnost kur.

EFFECT OF THE ORGANIC ACIDS OF SILAGE ON MINERAL METABOLISM AND PRODUCTIVITY OF HENS. *Sborn. Trud. Latv. Inst. Zivot. Vet.*, 1958, 9, 79-98.—In the first experiment 3 groups of 80 hens received a mixed practical ration; controls received this ration alone and experimental groups had supplements of silage, made from equal parts of maize cobs and cabbage, in amounts rising from 15 to 50 g. daily. For one group the silage was neutralised with mussel-shell meal. The hens ate the silage readily and even when given 50 g. did not leave more than 3 or 4 g. daily. For the 3 groups given no silage, silage neutralised and silage not neutralised, mean egg yields in the course of the study were 25.5, 26.9 and 27.4 and weights of eggs did not differ, nor did weights of shell. When, for a month, the hens were given, besides 1.5 g. mussel-shell daily in the basal ration and 1 g. extra for the middle group, free access to mussel-shell in boxes, they ate on the average 5.2, 4.6 and 5.8 g. per head daily, suggesting a fine adjustment of intake to needs.

Four groups of 3 hens in metabolism cages were given the basal ration alone or with lactic or acetic acid or both, first at 1.5 and then at 3 per cent. of the diet. The feeding periods were of 20 days and the balance periods were the last 5 days of each. The acids were not harmful and in all periods appeared to increased Ca retention without affecting that of P. There was no effect on weight of egg shells or on their Ca content. There was no significant effect on alkali reserve or on acidity of excreta. Eosinophil counts, stated to be an index of acidosis, were unchanged. The hens maintained good bodyweights and egg yields.

Five groups of 10 chickens 3 days old received a standard ration alone or with 1.5 per cent. lactic, acetic, citric or oxalic acid. Half the chickens were killed at 20 days and half at 30 days of age, 24 hr. after they had received an injection of $^{45}CaCl_2$ and Ca, P and ^{45}Ca were estimated in bone. Lactic, acetic and citric acids had no ill effect on growth or on weight of bone, but oxalic acid depressed growth and the birds looked miserable and ate poorly. It also depressed the ash content of the bone by about a third. Uptake of ^{45}Ca by bone was not affected by the first 3 acids; the chickens given oxalic acid had the same dose despite their lower bodyweights and about the same amount was taken up by the whole skeleton as in the normal birds, but the amount per g. bone was considerably greater. For most experiments the ^{45}Ca was given intramuscularly, but when it was given by mouth the chickens on the diet with oxalic acid incorporated much less into the whole skeleton, and also less per g. bone than the other groups; in that test, too, groups given lactic, acetic or citric acid incorporated somewhat more into the whole skeleton and per g. bone than those on the basal diet.

It is concluded that although the organic acids of silage are harmless to poultry, feeds rich in oxalic acid should be avoided.—D. Duncan. (Nutrition Abstracts & Reveiws)

BEILHARZ, R. G.

PROGRESS IN POULTRY NUTRITION RESEARCH. *Agric. Gas. N.S.W.*, 1959, 70, 488-492; 499.—The toxic substance present in some meat-and-bone meals appears to be localised in the inorganic fraction of the meal. It is believed to be formed during oxidative processes occurring during or after manufacture. The toxicity of the meal is lessened by the addition of an anti-oxidant during manufacture. A considerable amount of attention has been devoted to broiler production, and a diet has been evolved which gives satisfactory efficiency of feed conversion. The cause of uraemia is still unknown, but its incidence appears to be affected to some extent by nutritional factors.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

BERG, L. R.

ENZYME SUPPLEMENTATION OF BARLEY DIETS FOR LAYING HENS. *Poultry Sci.*, 1959, 38, 1132-1139. (State Coll. Washington, W. Washington Exp. Stat., Puyallup.)—Laying pullets which had all been reared on the same ration containing a mixture of barley and maize were used. In the first experiment egg production was recorded for 196 days in groups having the cereal portion of the ration as maize, barley, enzyme-treated barley or water-treated barley. No significant difference in egg production between the groups was seen. Efficiency of egg production favoured maize, which also gave the highest bodyweight gain. Treatment of barley with water increased the efficiency of egg production over that of untreated barley.

In the second experiment egg production was recorded for 168 days on rations in which the grain was maize, barley, barley treated with a fungal or bacterial enzyme, malt barley replacing part of the barley, or malt barley treated with a fungal enzyme. Again there was no significant difference between groups in egg production. Efficiency of egg production in all the groups was lower with barley than with maize. Bodyweight was highest with maize. Hatchability of fertile eggs from the maize group was 5 per cent. lower than that of barley groups but the difference was not significant; the addition of enzymes to the barley did not affect hatchability. Quality of the eggs was similar in all groups.

Yolk colour was better with maize. In May water consumption by the pullets was much less on the maize ration than on barley rations and addition of enzymes to the barley did not affect water consumption. This difference, though not so marked, was noted again in August.

In an experiment with chicks reared to 8 weeks addition of enzymes to barley stimulated growth almost to the same level as that obtained with maize. Feed efficiency was also improved by the addition of enzymes to barley but not to the level obtained with maize. Addition of the enzymes to barley also reduced water consumption.—J. S. Thomson. (Nutrition Abstracts & Reviews)

BEYER R. E., and R. D. KENNISON.

RELATIONSHIP BETWEEN PROTHROMBIN TIME AND OXIDATIVE PHOSPHORYLATION IN CHICK LIVER MITOCHONDRIA. *Arch. Biochem. Biophys.*, 1959, 84, 63-70. (Dept. Physiol., Tufts Univ. Sch. Med., Boston, Mass.)—Day-old chicks were given a diet deficient in vitamin K and some were given vitamin K or sulphaquinoxaline or both Plasma prothrombin times were measured as a means of detecting vitamin K deficiency. Sulphaquinoxaline prolonged prothrombin time and appeared to inhibit vitamin K activity. Oxidative phosphorylation of mitochondria from livers of experimental chicks and of normal rats and chicks in different substrates was measured manometrically. With preparations from normal liver, stimulation of oxygen consumption when hexokinase and glucose were added to a glutamate substrate was greater with rat than with chick mitochondria; the rates of exchange between adenosine triphosphate and inorganic phosphate, and of diphosphopyridine nucleotide oxidations, were also higher. No relation was found between prothrombin time and oxidative phosphorylation processes in liver mitochondria of chicks deprived of vitamin K. These findings failed to confirm the observations of Martius and Nitz-Litzow (Abst. 2986, Vol. 24).—A. M. Copping. (Nutrition Abstracts & Reviews)

BIELY, J., and B. E. MARCH.

THE RESPONSE OF CHICKS TO SEVERAL ANTIBIOTICS IN DIFFERENT DIETS AND ENVIRONMENTS. *Poultry Sci.*, 1959, 38, 771-774. [Dept. Poultry Sci., Univ. British Columbia, Vancouver.]—Three experiments are reported to compare the effect on growth of day-old chickens of oleandomycin with that of other antibiotics under different environmental conditions.

In the first a complete ration and one deficient in vitamin B complex were used and the antibiotics were added in the following amounts per ton: oleandomycin phosphate 5 mg., procaine penicillin G 2.5 mg., chlortetracycline HCl 10 mg. and oxytetracycline 10 mg. The chicken rooms and batteries had not been specially disinfected. With the deficient ration growth to 31 days was at a lower rate than with the complete ration. With each ration growth rate was increased by 17 to 18 per cent. by oleandomycin and by from 3 to 11 per cent. by the other antibiotics. With the deficient ration the response to the antibiotics was no greater than with the complete ration. With both rations there was some evidence of curled-toe paralysis.

In the next 2 experiments the deficient basal ration was used and the total anaerobe counts in the air of the chick rooms were 885 and 3355 per c. ft., respectively. With the unsupplemented rations growth to 35 days was greater in the more contaminated environment and oleandomycin again gave the greatest response, 34 and 21 per cent., respectively, in the less and more contaminated environments, compared with from 4 to 15 per cent. for the other antibiotics. Since growth was better in the more highly contaminated environment it is suggested that the environment with the lower bacterial count contained greater numbers of bacteria directly or indirectly harmful to chickens.—J. S. Thomson. (Nutrition Abstracts & Reviews)

BIERI, J. G., and C. J. POLLARD.

SERUM PROTEIN CHANGES IN VITAMIN E-DEFICIENT CHICKS. *J. Nutrition*, 1959, 69, 301-305. (Lab. Nutrit. Endocrinol., Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.)—The normal serum protein pattern was ascertained in New Hampshire chicks from 14 to 21 days old, reared on 4 diets on which growth was normal; a commercial starting ration, a purified diet with all vitamins, a purified vitamin-E-free diet including torula yeast and supplemented with α-tocopheryl acetate 100 mg. per kg., and the vitamin-E-free diet without torula yeast and with 0.5 p.p.m. selenium. There was no significant change in total serum protein or in albumin : globulin ratio during this age period; average values for 9 chicks were 3.52 ± 0.7 per cent. and 0.425 ± 0.16. Chicks given the vitamin-E-free diet without supplement showed signs of exudative diathesis about the 12th day. Samples of serum from individual chicks were taken before and immediately after signs appeared. Two or three days before exudates were noticed, total serum protein and albumin : globulin ratio were normal; as soon as exudates appeared the ratio fell, though the decrease did not seem sufficient to account for the oedema. Total serum protein decreased in some chicks, but not in others. The electrophoretic pattern was little altered. In chicks which recovered spontaneously the electrophoretic pattern showed increases of α_2-, α_2-, β- and γ-globulins. When such chicks were maintained on the deficient diets for 3 to 4 weeks, the serum pattern returned to normal. Administration of vitamin E or Se restored the normal pattern in one week.—E. M. Cruickshank. (Nutrition Abstracts & Reviews.

BIERI, J. G., G. M. BRIGGS, C. J. POLLARD, and M. R. S. FOX.

NORMAL GROWTH AND DEVELOPMENT OF FEMALE CHICKENS WITHOUT DIETARY VITAMIN E OR OTHER ANTI-OXIDANTS. *J. Nutrition*, 1960, 70, 47-52. (Lab. Nutrit. Endocrinol., Nat. Inst. Arthritis Metabol. Dis., Nat. Insts. Health, Bethesda, Md.)—Two experiments with New Hampshire day-old female chickens are reported. In the first the basal diet contained purified casein as source of protein, no fat, vitamin E or anti-oxidant, and the supplements tested were 10 per cent. vitamin-E-free lard, 100 mg. α-tocopheryl acetate per kg. diet, or the latter with 4 per cent. maize oil. Crystalline vitamin A acetate, 30 mg. per kg. diet, dissolved in ethanol was included in all diets, which were given for 24 weeks. The chickens deprived of vitamin E grew and survived as well as those given it, and those given the lard appeared normal and weighed more than those given maize oil and tocopherol. At 4 weeks of age chickens deprived of vitamin E had none in the blood serum. Subsequent investigation showed that the casein contained sufficient Factor 3 to prevent exudative diathesis, and the amount of lard was insufficient to produce encephalomalacia.

In the second experiment with 2 groups of 12 chickens, the basal diet contained 30 per cent. soya bean protein and 4 per cent. vitamin-E-free lard, and, for the first 6 weeks, 30 per cent. torula yeast; selenium, 0.5 mg. per kg. diet as sodium selenite, was added to prevent exudative diathesis. Vitamin A was added weekly to the drinking water at the rate of 750 μg. per liter. One group were given a supplement of α-tocopheryl acetate, 50 mg. per kg. diet.

During 45 weeks the group deprived of vitamin grew as well as the group given the supplement, and they began to lay at the same age. Haematocrit and Hb values at 19 weeks of age and total serum protein at 32 weeks were similar in the 2 groups. Tocopherol in liver, heart and breast, estimated by the method of Green *et al.* (Abst. 4814, Vol. 25) fell to zero after about 5 weeks on the vitamin-E-deficient diet; birds given α-tocopherol had at least 10 μg. per g. Eggs from deprived hens contained no vitamin E. (For other biochemical studies see Abst. 304, Vol. 30.)

The findings are discussed and it is suggested that the primary function of vitamin E in diets such as were used here is that of an anti-oxidant to protect vitamin A.—J. G. Gordon. (Nutrition Abstracts & Reviews)

BIXLER, D. and J. C. MUHLER.

RETENTION OF FLUORIDE IN SOFT TISSUES OF CHICKENS RECEIVING DIFFERENT FAT DIETS. *J. Nutrition*, 1960, 70, 26-30. (Dept. Biochem., Indiana Univ. Med. Centre, Indianapolis.)—Five series, each of 3 groups of 10 day-old chicks, were kept for 8 weeks in cages in a controlled environment. The first had a semi-purified diet with no added fat; the other 4 series received less sucrose in the diet and 20 per cent. cottonseed oil, oleic acid, stearic acid or lard. To 2 groups on each diet NaF was given, either 2 mg. per bird daily by stomach tube or 0.5 mg. daily intraperitoneally.

Oleic acid and lard gave the greatest gains of bodyweight, and stearic acid produced the least, and also the greatest morbidity. Birds given fat had heavier adrenals. The livers of those not given fat were depleted of glycogen and the cells contained fat droplets, but in birds given fat the cells contained glycogen. The thyroids in birds given lard were slightly heavier than in the others. Serum cholesterol was not affected by NaF but was increased by fat after 6 weeks on experiment and was greatest with the lard diets.

Total body storage of F was increased slightly but F concentration was not affected by fats, except that with cottonseed oil and no added F both total carcase F and concentration were the lowest of all. With cottonseed oil or oleic acid chicks without added F had slightly less total F in the femur than any other group. When NaF was given all fats increased F retention. Total F in the femur was similar for all series, which suggests that F was being retained by the soft tissues. Retention of injected F was twice as great as when it was given by mouth, perhaps because availability of F in food was reduced by diet calcium.

In heart, kidney, brain and muscle, but not in liver, fat in the diet increased concentration of F in tissue even when no supplement of F had been given. Birds which received F with cottonseed oil, oleic acid or lard had lower levels of F in liver than birds given stearic acid or no fat; and those given F with stearic acid or lard had less F in muscle than those given cottonseed oil, oleic acid or not fat. Of the soft tissues examined brain had the highest F concentration.—J. F. Gordon. (Nutrition Abstracts & Reviews)

BLOUNT, W. P.

CALCIUM LACTATE AS A DIETARY SUPPLEMENT FOR LAYING HENS. *Vet. Rec.*, 1960, 72, 90.—The results of Worden and Reid (Abst. 6792, Vol. 29), in which calcium lactate pentahydrate in the diet increased egg production and decreased feed intake, were not confirmed by the present study. The composition and cost of the diet used are criticised.—J. G. Gordon. (Nutrition Abstracts & Reviews)

BOLTON, W.

THE EFFICIENCY OF FOOD UTILIZATION FOR EGG PRODUCTION BY PULLETS AND YEARLING HENS. *J. Agric. Sci.*, 1959, 52, 364-368. [Agric. Res. Counc. Poultry Res. Centre, West Mains Rd., Edinburgh.]—The experiment already reported with pullets (Abst. 4522, Vol. 28) was continued into the second laying year. Egg production was again higher on the low-energy than the high-energy mash, and on each, production in the second year was less than in the first. Feed consumption was less on high- than on low-energy in both years, and was less in the older birds. There was little difference between ages or diets in intakes of digestible protein, non-protein digestible energy or metabolisable energy. Gross efficiency of utilisation of both energy and protein for egg production was less in the older birds, but the result was not considered conclusive, since numbers were small. It was shown that egg production increased proportionately more than feed intake, and thus high-producing birds were more economical.

Analysis of the mashes each time they were mixed during the year, 18, for high- and 25 for low-energy, showed that there can be a wide variation in proximate composition and energy content. The practical implications of this are discussed.—T. D. Bell. (Nutrition Abstracts & Reviews)

CAREW, L. B. (Jr.), R. RENNER, and F. W. HILL.
GROWTH STIMULATING EFFECT OF SOYBEAN OIL AND UNEXTRACTED SOYBEAN FLAKES IN CHICK RATIONS. *Poultry Sci.*, 1959, 38, 1183-1184. (Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.)—A low-fat basal ration was used containing 38.5 per cent. soya bean oilmeal and 49 percent. cerelose with addition of growth factors, minerals and vitamins. One experimental group had 55.8 per cent. heat-treated full-fat soya bean flakes to replace the soya bean oilmeal and another had soya bean oilmeal 45 and degummed soya bean oil 10.8 per cent. to give a protein content similar to that in the soya bean flake ration. All rations were similar in metabolisable energy. In 2 experiments growth of chickens to 4 weeks showed that the heat-treated flakes were as effective as degummed soya bean oil for stimulating growth and improving feed efficiency.—J. S. Thomson. (Nutrition Abstracts & Reviews)

CARLSON, C. W.
EFFECTS OF ANTIBACTERIAL AND ANTIFUNGAL AGENTS IN DIETS FOR LAYING AND BREEDING HENS. *S. Dakota Agric. Exp. Stat. Tech. Bull.*, No. 22, May 1959, pp. 23—The effect of chlortetracycline, oxytetracycline, penicillin, streptomycin, oleandomycin, arsanilic acid, furazolidone, nitrofurazone and nystatin in all-mash diets was studied over 2 years. It is concluded that egg production, if low, may be increased by the use of antibiotics, but no response will be obtained if egg production is about 70 per cent. None of the supplements consistently affected egg quality except for shell thickness, which was slightly increased in some trials by tetracycline compounds.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

CARVER, D. S.
THE EFFECT OF AGE ON THE EXPERIMENTAL ERROR OF BROILER NUTRITION STUDIES. *Poultry Sci.*, 1959, 38, 767-770. [Larro Res. Farm, General Mills Inc., Indianola, Iowa.]—In 17 experiments with crossbred chickens weights and feed conversion ratios were obtained at ages of 3 to 4 weeks and 8 to 9 weeks. In most of the experiments there were 24 or 50 birds in each of 24 or more pens, and there were 2 or 3 pens on each of a number of rations. The average coefficient of variation in weight between replicate pens was 3.8 per cent. at 3 to 4 and 2.6 per cent. at 8 to 9 weeks; the difference was significant. For feed conversion the mean coefficients of variation were 4.1 and 2.4 per cent., respectively, and the difference was again significant.—I. McDonald. (Nutrition Abstracts & Reviews)

CHARKEY, L. W.
METHIONINE, IODOCASEIN AND OXYGEN CONSUMPTION OF CHICKS. *J. Nutrition*, 1959, 69, 295-300. (Dept. Chem., Colorado State Univ., Fort Collins.)—Chicks were given a basal diet lacking vitamin B_{12} and methionine, but with histidine and *iso*-leucine in excess, alone or with supplements of vitamin B_{12}, or DL-methionine or both, or iodocasein. Iodocasein increased oxygen consumption, but reduced growth and feed efficiency and caused enlargement of the liver. Methionine reversed all those effects, both in presence and absence of iodocasein, and reduced total N excretion, almost entirely because of reduction in excretion of uric acid N. The greater excretion of uric acid N which occurs in methionine deficency is attributed to diversion of N from tissue protein. Vitamin B_{12} also, in absence of methionine, slightly reduced uric acid excretion, improved growth and feed efficiency and reduced liver size. Though less effective than methionine, it corrected to some extent the amino acid imbalance.—E. M. Cruickshank (Nutrition Abstracts & Reviws)

CHOUDHURY, R. B. R. and R. REISER.
INTERCONVERSIONS OF POLYUNSATURATED FATTY ACIDS BY THE LAYING HEN. *J. Nutrition.* 1959, 68, 457-464. (Dept. Biochem. Nutrit., Texas Agric. Exp. Stat., College Station.)—Hens were

given a stock diet, containing 0.55 per cent. linoleic acid, alone or supplemented with 10 or 20 per cent. safflower oil, which raised the linoleic acid content to 7.5 and 15.0 per cent. The triglyceride fatty acids of egg yolks from hens on the stock diet contained 10 per cent. linoleic acid, increased to over 30 per cent., mainly at the expense of oleic acid, when 7.5 per cent. linoleic acid was added to the diet. No further increase was obtained with linoleic acid 15 per cent., which indicated that there was a limit to the deposition of polyunsaturated fatty acids. The trienoic acid content was little influenced by linoleic acid supplements. When the hens were given the stock diet, the triglyceride fatty acids contained 0.5 per cent. arachidonic acid. The value rose to 2 per cent. when the diet contained 7.5 or 15 per cent. linoleic acid, but the rise was transient. The pentaenoic acids were not affected by linoleic acid. With 7.5 or 15.0 per cent. linoleic acid, the linoleic acid content of yolk phospholipids rose, apparently to a maximum of 30 from an initial value of 15 per cent. The trienoic acid content was increased by 7.5 per cent. linoleic acid from 1 to 4 per cent. but the increase was not maintained, even when the diet contained 15 per cent. linoleic acid. Tetraenoic acid was increased temporarily by 7.5 per cent. linoleic acid and to a maximum of 10 per cent. when intake of linoleic acid was doubled. The pentaenoic and hexaenoic acid contents of the phospholipids were not influenced by linoleic acid.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

CLANDININ. D. R., R. RENNER, and A. R. ROBBLEE.

RAPESEED OIL MEAL STUDIES. 1. EFFECTS OF VARIETY OF RAPESEED, GROWING ENVIRONMENT AND PROCESSING TEMPERATURES ON THE NUTRITIVE VALUE AND CHEMICAL COMPOSITIONS OF RAPESEED OIL MEAL. *Poultry Sci.*, 1959, 38, 1367-1372. (Univ. Alberta, Edmonton.)—1. Expeller-processed rapeseed oilmeals from either Argentine or Polish rapeseed were given as 5 to 28 per cent. of the ration for chickens for 4 weeks, replacing soya bean oilmeal. The ration had 22 per cent. protein. The ratio of thyroid weight to bodyweight was calculated at 8 weeks. Control groups received soya bean oilmeal alone. The Argentine variety was more detrimental to growth and more goitrogenic than the Polish; 10 per cent. of the Argentine variety depressed growth, but 15 to 20 per cent. of the Polish variety was needed. Thyroid weight to bodyweight ratio was doubled with 5 per cent. Argentine meal but it took 15 per cent. of the Polish meal to achieve this effect. The poorer growth obtained with the Argentine meal was shown to be due partly to a deficiency of lysine. The depressing effects of the 2 rapeseed meals on growth are also attributed to the presence in each of a mustard oil, allylcarbinyl *iso*thiocyanate, which is probably converted to the goitrogen L-5-vinyl-2-thio-oxazolidone; the presence of these substances was confirmed in the 2 varieties, and in others, grown in Alberta, the amounts depending on variety and environmental conditions.

Further growth experiments with chicks showed that the processing temperatures used in preparing the meals affected their feeding values. Growth was better with meals processed at 220° to 240° F. than at 250° to 280°. At the lowest temperature the lysine content of protein was reduced from 6.42 to 5.69 and at the highest to 4.12 per cent. All the meals were goitrogenic.—J. S. Thomson. (Nutrition Abstracts & Reviews)

COATES. M. E., and G. F. HARRISON.

THE EFFECT ON CHICK GROWTH OF INACTIVATED PENICILLIN, MINERAL SULPHATES OR FURAZOLIDONE SUPPLEMENTS. *Brit. J. Nutrition*, 1959, 13, 345-355. (Nat. Inst. Res. Dairying, Univ. Reading.)—From 1 day to 4 weeks old chickens were kept in a room where response to penicillin was regularly obtained. Food and water were offered to appetite.

In experiments with different types of active and inactivated penicillin, equivalent to 10, 25 or 40 mg. benzylpenicillin per kg. diet, it was found that, despite differing basal diets, inactivated penicillin or its

degradation products, D-penicillamine or phenylacetic acid, had no growth-promoting action but active forms of penicillin had a marked effect.

There was no significant increase in bodyweight when copper sulphate was added as 0.05 per cent. of the diet, and 0.1 per cent. depressed it; this was true also when a diet low in animal protein was used and when manganese chloride replaced manganese sulphate in the basal diet. Potassium sulphate did not increase growth rate on either normal or low-animal-protein diets or with manganese chloride replacing manganese sulphate; the replacement of manganese sulphate by manganese chloride had no effect in itself.

Furazolidone, 7.5 mg. per kg. diet, significantly increased liveweight gain to the same extent as did procaine penicillin. When furazolidone and penicillin were given together the growth increase was significantly greater than with either substance alone. The findings are discussed.—J. G. Gordon. (Nutrition Abstracts & Reviews)

COATES, M. E., and **M. K. DAVIES.**

THE EFFECTS OF CONTINUOUS ADMINISTRATION OF PENICILLIN TO SUCCESSIVE GENERATIONS OF CHICKS. *Brit. J. Nutrition*, 1959, 13, 205-212. [Nat. Inst. Res. Dairying, Univ. Reading.]—Two flocks of Light Sussex hens were maintained for 3 generations on a fully adequate diet, supplemented or not with procaine penicillin, 45.5 g. per ton chick mash and 10 g. per ton breeders' and growers' mash. The chicks were housed from 0 to 4 weeks of age in brooders, from 8 to 10 weeks in movable fold units on grass and subsequently in wooden houses with grass runs. The growth response to penicillin of successive generations was measured by the percentage increase of weight at 4 weeks of age of the birds receiving penicillin over that of the corresponding controls. The chicks were reared in premises thoroughly cleaned annually, but otherwise in constant use. Egg production, hatchability and mortality also were recorded for two breeding flocks.

Continuous administration to one generation of penicillin from hatching to maturity did not influence the ability of the next generation to respond to penicillin, nor was any detrimental effect observed. There was a slight apparent improvement of egg production, hatchability and bodyweight of the chicks when penicillin was given, but it was not cumulative through successive generations. Over a period of 5 years the growth response to penicillin of commercially bred chicks, reared to 4 weeks of age, did not vary, nor was there any change in the absolute weight of the birds.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

CORDIEZ, E. Alimentation et productivite dans la production du poulet de chair.

FEEDING AND PRODUCTIVITY IN THE PRODUCTION OF TABLE POULTRY. *Rev. Agric., Brussels*, 1959, 12, 753-771. (Ecole Med. Vet. Etat, Cureghem, Brussels.)—A review of the development of the broiler industry in Europe and the United States and of some feeding experiments in the U.S. which have led to the high efficiency now realised in broiler production. No bibliography is given.—T. D. Bell. (Nutrition Abstracts & Reviews)

COUCH, J. R. Probleme der Geflugelernahrung.

PROBLEMS OF POULTRY FEEDING. *Deutsch. Writschafts-geflugelzucht*, 1959, 11, 1150-1151: 1960, 12. 2-3. (Abt. Biochem., Landwirtsch. Versuchsstat., Texas.) (Nutrition Abstracts & Reviews)

CURTO, G. M. Qualche precisazione sull'impiego degli antibiotici nell'alimentazione dei polli da carne allevati a terra.

THE USE OF ANTIBIOTICS IN FEEDING MEAT CHICKENS ON FREE RANGE. *Zootec. Vet.*, 1959. 14, 161-172. (Ist. Zootec. Gen., Univ. Milan.) English summary.—The basal ration given to 3 groups of

111 cross bred chickens from 2 days old to 72 days had 23 per cent. crude protein. The protein was of mixed origin, and good amino acid balance. The chickens were reared outdoors and feed and water were allowed to appetite. The experimental groups were given terramycin, 15 or 30 mg. per kg. feed. Final weight was significantly better in the group given 30 mg. than in the other groups, which were similar. Feed and water per kg. gain were slightly, but not significantly, greater with both levels of antibiotic, and mortality was less. The greatest response was in the first few weeks and during this period there was a response to 15 mg terramycin also. The effect of amino acid balance and adequate vitamins in the ration on response to antibiotics is discussed.—T. D. Bell. (Nutrition Abstracts & Reviews)

DAM, H., G. KRISTENSEN, G. K. NIELSEN, and **E. SONDERGAARD.** INFLUENCE OF DIETARY CHOLESTEROL, COD LIVER OIL AND LINSEED OIL ON CHOLESTEROL AND POLYENOIC FATTY ACIDS IN TISSUES FROM FASTED AND NON-FASTED CHICKS. *Acta physiol. scand.*, 1959, 45, 31-42, [Dept. Biochem. Nutrit., Polytech. Inst., Copenhagen.]—Six groups of 10 chicks were given a commercial diet for 14 days after hatching and then experimental diets containing no fat or 10 per cent. cod liver oil or 10 per cent. linseed oil alone, of with 1 per cent. cholesterol; the fats replaced sucrose in the basal diet. After 4 weeks the chicks were killed, and cholesterol and polyenoic fatty acids were estimated in plasma, aorta, heart, liver, brain and fat tissue; half of each group fasted for the last 16 to 18 hr.

The fasted chicks which had been on the fat-free diet had significantly higher plasma cholesterol values than those which had not fasted. There was no significant difference in cholesterol content of other tissues. Without added cholesterol there was no difference in tissue cholesterol between the chicks given cod liver oil and those given linseed oil; with cholesterol in the diet, linseed oil caused higher cholesterol values in plasma, heart, liver and fat tissue.

The fasted chicks which had been on the fat-free diet had a higher content of polyenoic fatty acids in liver than those not fasted. With the other diets studied there was no significant effect of fasting. The cod liver oil diet without cholesterol caused deposition of pentaeonic acid in heart and liver and less in fat tissue and brain; hexaenoic acid was much increased in liver and brain, and to some extent in heart, but much less in fat tissue. Cholesterol with cod liver oil diet did not appear to affect the deposition of polyenoic acids, except for a decrease of hexaenoic acid in liver. The linseed oil diet without cholesterol caused accumulation of pentaenoic acid in heart and particularly in liver, but deposition of pentaenoic acid was less in brain and did not occur in fat tissue; trienoic acid decreased with the increase of pentaenoic acid in heart and liver. Cholesterol in the linseed oil diet gave slightly more trienoic acid and slightly less of the more highly unsaturated fatty acids in liver and heart.—G. F. Garton. (Nutrition Abstracts & Reviews)

DAM, R., A. B. MORRISON, and **L. C. NORRIS.** STUDIES ON UNIDENTIFIED CHICK GROWTH FACTORS APPARENTLY ORGANIC IN NATURE. *J. Nutrition*, 1959, 69, 277-282. (Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.)—For 4 weeks day-old chicks received one of two simplified diets composed largely of maize and soya bean meal and adequate in the required known vitamins, supplemented with a mixture of distiller's dried solubles, fish solubles and dried whey (UGF), or with liver extract, as sources of unidentfied growth factors, or with the ash of these sources. The growth obtained with UGF was significantly greater than that obtained when the ash derived from this supplement was given. Liver extract also greatly increased growth over that obtained on the basal diet, the increase being about equal to that produced by a supplement of UGF ash. The ash of the liver extract had no significant effect on growth. The beneficial effect of UGF ash is attributed to its relatively high Zn content,

and the effect of the intact UGF and liver extract to unidentified organic substances. It is suggested that liver extract may contain an organic substance which replaces Zn or renders it more available.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

DAM, R., R. M. LEACH (Jr.), T. S. NELSON, L. C. NORRIS, and F. W. HILL.

STUDIES ON THE EFFECT OF QUANTITY AND TYPE OF FAT ON CHICK GROWTH. *J. Nutrition*, 1959, 68, 615-632. (Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.)—Purified basal diets with 5, 10 or 20 per cent. maize oil were given to day-old chicks housed on wire mesh floors to prevent coprophagy. A constant relation between energy and protein, minerals and vitamins in the diets was maintained. Additions were made of supplements containing unidentified growth factors, some non-hydrogenated vegetable oils, a hydrogenated vegetable oil, lard and K at different levels.

When vegetable oil was increased from 3 to 10 per cent. growth rate improved. The level of K in the diet had no effect. Increasing the level of oil above 10 per cent. gave no further improvement in growth, except when there was no unidentified growth factor, but levels of oil above 10 per cent. increased efficiency of gain. The growth factors improved growth at all levels.

Hydrogenated vegetable oil was inferior to unhydrogenated in promoting growth and efficiency of feed utilisation. Lard was as good in the absence of unidentified growth factors and was intermediate between the hydrogenated and unhydrogenated oils when the growth factors were supplied.

The value of the higher levels of vegetable oil was not due to better energy levels in the diet, or to limited capacity of the chicks for feed, or to the lower specific dynamic action of fat. It was concluded that the glyceride fraction of maize oil or some unknown substance not readily removed by molecular distillation was responsible for improved growth.—J. G. Gordon. (Nutrition Abstracts & Reviews)

DOUGLAS, C. R., and R. H. HARMS.

PEANUT OIL MEAL AS A SOURCE OF PROTEIN IN BROILER DIETS. *Poultry Sci.*, 1959, 38, 786-790. [Florida Agric. Exp. Stat., Gainesville.]—Groups of day-old chickens, containing equal numbers of males and females, were reared to 8 weeks on a fortified maize and soya bean oilmeal ration containing 28.1 per cent. soya bean meal, or on this ration with 25, 50, 75 per cent, or all the soya meal replaced by groundnut oilmeal. The rations were similar in protein and energy.

The results of 3 experiments showed that when 50 per cent. groundnut meal replaced a similar amount of soya bean meal growth rate was restricted and that restriction increased as the level of groundnut meal rose. Efficiency of feed utilisation also was adversely affected. In all experiments there was evidence that the decrease of rate of gain with level of substitution was much less in females than in males, so that females are more tolerant to groundnut meal. Adding 0.25 per cent. lysine to the ration in which groundnut meal completely replaced soya meal significantly improved rate of growth, but adding methionine also had little additional effect, so that lysine was the chief limiting amino acid. Adding lysine, methionine and glycine to a ration containing half the protein from each source gave growth equal to that obtained with a ration with soya meal only. When all the soya meal was replaced by groundnut meal adding the 3 amino acids gave bodyweights equal to those obtained from a ration containing equal amounts of the 2 proteins, but less than those obtained from a ration with soya bean only.—J. S. Thomson. (Nutrition Abstracts & Reviews)

DZINGAJTE, S. Vlijanie ozernogo sapropelja na razvitie cypljat i jajcenoskost kur.

EFFECT OF LAKE SAPROPEL ON GROWTH OF CHICKENS AND EGG PRODUCTION BY HENS. *Pticevodstvo*, 1959, No. 8, 37-38.

(Inst. Biol. Akad. Nauk, Lithuanian SSR.)—Sapropel, lake slime, was almost as good as biomycin in its effect on growth of chickens, and in combination with biomycin it accelerated sexual development of cockerels. When it was given to pullets from the age of 150 days it increased egg yield in the first season by 23 per cent., but when it was given with biomycin the increase was less. Sapropel is considered a useful source of vitamin B_{12} and trace elements.—D. Duncan. (Nutrition Abstracts & Reviews)

EDEN A.

FARM MILLING AND MIXING POULTRY RATIONS. *Agriculture, J. Minist. Agric. Engl.*, 1959, 66, 217-222. (Nat. Agric. Advisory Serv., Cambridge.) (Nutrition Abstracts & Reviews)

EDMONDSON, J.

TRIAL SHOWS THAT HIGH-ENERGY POULTRY MASHES GIVE BETTER RETURNS THAN CHEAPER MIXTURES. *N.Z.J. Agric.*, 1959, 99, 135-137. (Dept. Agric., Upper Hutt.)—High energy mashes with 17 or 15 per cent. protein, and a conventional mash, were compared using 3 groups of 80 crossbred pullets at point of lay, housed intensively and studied for 40 weeks. The mashes initially contained more protein than stated but 1¾oz. whole wheat scratch feed per day per bird reduced the protein to the stated levels.

On the high-energy diet with 17 per cent. protein average egg production was 184 per bird, and gross profit for the group, calculated from feed cost, was £199 10s for the 40 weeks; on high-energy mash with 15 per cent. protein production was 180 eggs and profit £201; and on the standard mash 172 eggs and profit £177. Thus the high-energy mashes were preferable and did not require a higher level of protein than conventional mash.—J. G. Gordon. (Nutrition Abstracts & Reviews)

EDMONDSON, J., and F. C. BOBBY.

DEHYDRATED LUCERNE MEAL AS SCOURCE OF VITAMIN A FOR LAYING PULLETS. *N.Z.J. Agric.*, 1959, 99, 341; 343-344. (Dept. Agric., Upper Hutt, Wellington.)—Four per cent. of good quality lucerne meal is the minimum supplement to a diet which will produce a dep yellow colour in yolk eggs. The same amount was sufficient to supply the vitamin A requirement of pullets, leaving a reserve in the liver of 370 I.U. per g. compared with 136 when a synthetic vitamin A supplement was given.

Cost of production and efficiency of feed utilisation were similar for both types of supplement, but eggs with good yolk colour sell better.

In the same experiment, in which the pullets were exposed to direct sunlight, some were given vitamin D_3 also, without effect on feeding efficiency or egg production. Nevertheless, since hens do not always get enough sunlight, provision of vitamin D is recommended.—M. E. Falconer. (Nutrition Abstracts & Reviews)

EDWARDS, H. M. (Jr.)

THE AVAILABILITY TO CHICKS OF ZINC IN VARIOUS COMPOUNDS AND ORES. *J. Nutrition*, 1959, 69, 306-308. (Poultry Dept., Univ. Georgia, Athens.)—Day-old cockerels were housed on pine shaving litter in wooden cages covered with plastic. The basal synthetic diet was supplied in hard cardboard troughs. The availability of Zn in 7 ores and 5 other compounds was evaluated from a standard growth response curve, obtained by supplementing the basal diet with 10, 20 or 40 p.p.m. Zn as pure $ZnSO_4$. Willemite, Zn metal, $ZnCO_3$ ZnO of technical or A.R. grade, smithsonite, hemimorphite or zincite were all available sources of Zn, Zn in sterling black and brown crude ore was relatively less available, while that in sphalerite and franklinite had very low availability.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

EDWARDS, H. M. (Jr.) and R. J. YOUNG.

CALCULATION OF THE NUTRIENT REQUIREMENTS FOR BROILERS. *Poultry Sci.*, 1959, 38, 1430-1432. (Poultry Dept., Univ.

Georgia, Athens.)—The method is based on expected ratio of weight of total feed required to unit weight gain and the amount in mg. of each nutrient required per g. of gain. For calculating the ratio 2 equations relating protein and productive or metabolisable energy are presented which have been shown to be valid for heavy breeds in a temperature-controlled environment when productive energy values of Donaldson *et al.* (Abst. 2781, Vol. 27) and metabolisable energy values of Hill, F. W. (private communication, 1958) are used. A third equation is used to calculate the nutrient requirements as mg. per 100 g. ration from the ratio of feed to gain obtained and corrected according to U.S. National Research Council figures for nutrient requirements. The advantages of this system are outlined.—J. G. Gordon. (Nutrition Abstracts & Reviews)

FANGAUF, R. and **VOGT, H.** Kukenwuchsprufung mit selbstemulgierendem Dorschlebertran.

CHICK GROWTH TEST WITH SELF-EMULSIFYING COD LIVER OIL. *Arch Geflugelk.*, 1959, 23, 277-281. (Lehr- Versuchsanst. Kleintierzucht, Kiel-Steenbek.) English summary.—Five groups of 32 New Hampshire day-old chicks were given for 8 weeks a basal all-mash ration with no supplement or with a dry vitamin A and D_3 concentrate (Rovimix) to supply vitamin A 6000 and vitamin D_3 600 I.U. per kg. feed, or 0.5 per cent. pure cod liver oil, or 0.5 per cent. self-emulsifying cod liver oil, or 1.25 per cent. cod liver oil emulsion containing 40 per cent. liver oil. Total weight gains were 349, 587, 545, 587 and 597 g. and kg. feed per kg. gain were 4.62, 3.18, 3.41, 3.30 and 3.39.—R. G. Hankin. (Nutrition Abstracts & Reviews)

FANGAUF, R., H. VOGT, and **H. BOYSEN.** Antibiotica in der Futterung von Legehennen im Ablegebetrieb.

ANTIBIOTICS IN THE FEEDING OF LAYING HENS ON THE BREEDING FARM. *Arch. Geflugelk.*, 1959, 23,349-353. (Lehr- Versuchsanst. Kleintierzucht, Kiel-Steenbek.) English summary.—Three groups of 181 inbred Leghorn laying hens on deep litter were given 50 g. cereals daily, mussel shell and a laying meal to appetite with no antibiotic or with Aurofac 2A supplying 10 or 50 mg. aureomycin per kg. feed. In 32 weeks eggs laid numbered 170.7, 172.7 and 164.5 and final weights of hens were 1.774, 1.800 and 1.896 kg. The antibiotic had no significant effect on intake of laying meal, about 84.5 g. daily, or on mortality. Net profits were highest without antibiotic and lowest with 50 mg. It is concluded that the use of aureomycin in a laying meal is, on economic grounds, not advisable.—R. G. Hankin. (Nutrition Abstracts & Reviews)

FISHER, H., P. GRIMINGER and **G. A. LEVEILLE.**

PROTEIN DEPLETION AN AMINO ACID REQUIREMENT IN THE GROWING CHICKEN. *J. Nutrition*, 1959, 69, 117-120. (Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.)—Cockerels, some depleted of protein, were given a diet containing 20 per cent. protein and methionine 0.2 to 0.4 or lysine 0.8 to 1.2 per cent. In the depleted birds, a growth response was obtained with each increment of the amino acid supplied, but in those not depleted maximum growth was obtained with about 0.3 to 0.35 per cent. methionine or 1 per cent. lysine. Chicks not depleted required only 16 per cent. protein if 1 per cent. lysine was supplied, but depleted chicks required 20 per cent. protein when the diet contained 1.2 per cent. lysine. They responded also to higher protein levels, provided the lysine : protein ratio remained constant. It is concluded that though depleted chicks required greater absolute amounts of methionine and lysine than those not depleted, the greater need is only a reflection of a greater protein requirement.—E. M. Cruickshank .(Nutrition Abstracts & Reviews)

FULLER, H. L. and **W. S. DUNAHOO.**

THE EFFECT OF VARIOUS DRUG ADDITIVES ON THE VITAMIN B_{12} REQUIREMENT OF CHICKS. *Poultry Sci.*, 1959, 38, 1150-1154. (Div. Poultry Husb., Univ. Georgia, Athens.)—In 2 experi-

ments reported a purified vitamin B_6-deficient diet was used, containing 0.5 mg. vitamin B_6 per lb. Chicks on this diet showed signs of depletion within 2 days. When a stabilising level of 0.5 mg. vitamin B_6 per lb. diet was added normal growth was immediately resumed, neraly equivalent to that obtained by adding 5 mg. vitamin B_6 per lb. At 7 days of age 96 chicks from the "stabilised" group were divided into 4 groups to receive the basal diet alone or supplemented with 0.5, 1 or 2 mg. vitamin B_6 per lb. On each diet half the chicks received a combination of nitrofurazone 0.011 per cent. and furazolidone 0.0016 per cent., with arsanilic acid 0.01 per cent. In the groups receiving one of the drugs growth to 14 days was much reduced at all levels of vitamin B_6 intake, most in the group receiving no added vitamin B_6. In the untreated groups 0.5 mg. added vitamin B_6 per lb. appeared to be ample for normal growth, but in the treated groups 1.0 mg. vitamin B_6 per lb. was required.

In the second experiment groups of chicks were given for 14 days the basal diet alone or supplemented with the same amounts of vitamin B_6 as before. With each of the diets the effect on growth of the same drugs in different combinations was tested. Nitrofurazone in any combination greatly depressed growth whatever the level of vitamin B_6. Furazolidone given with arsanilic acid depressed growth in absence of added vitamin B_6 but permitted growth equal to that of the untreated group when vitamin B_6 was added. In many cases, however, the significance of differences in rate of growth was obscured by high mortality. In this experiment 1.0 mg. added vitamin B_6 per lb. was required for maximum growth, so that the total requirement is judged to be 1.5 mg. per lb.—J. S. Thomson. (Nutrition Abstracts & Reviews)

FURRER, O. J., A. SCHURCH, and **E. CRASEMANN.** Uber die Bedeutung des Cholins in der Kukenmast.

IMPORTANCE OF CHOLINE IN FATTENING CHICKENS. *Arch. Geflugelk.*, 1959, 23, 257-269. (Inst. Haustierernahrung, Eidg. Tech. Hochsch., Zurich.) English summary.—Two groups of 15, later reduced to 9, Leghorn cockerels, 6 days old, housed in individual cages with wire floors were given a basal ration with minerals and vitamins. The choline content of the ration, 1560 mg. per kg., was increased for 1 group by adding 1 g. choline chloride, supplying 870 mg. choline, per kg. feed. After 8 weeks total weight gains were 527.9 and 492.7 g., kg. feed per kg. gain 3.74 and 3.89, feed costs Fr. 2.29 and 2.33 and vitamin A in liver 2085 and 1579 μg. for the group given the choline supplement and the control group, respectively. Incidence of perosis was reduced by about about 60 per cent. when the choline supplement was given.

Two groups of 250 day-old chickens housed on wooden floors covered with deep straw were given a commerical feed with minerals, vitamins, antibiotics and coccidiostats, containing 1.15 g. choline supplying 1 g. with or without a supplement of 1.15 g. choline chloride supplying 1 g. choline per kg. feed. After 10 weeks weights were for males 1065.3 and 1034.1 and for females 916.5 and 897.8 g. kg. feed per kg. grain 3.448 and 3.613, and feed cost Fr. 2.11 and 2.17. At slaughter at 90 days of age liveweights were 1406.3 and 1357.3 g. and carcase yields 81.48 and 82.06 per cent. Significantly more chickens of the group given added choline were of the first quality. No perosis was seen throughout the trial.—R. G. Hankin. (Nutrition Abstarcts & Reviews)

GARDINER, E. E., F. N. ANDREWS, R. L. ADAMS, J. C. ROGLER, and **C. W. CARRICK.**

THE EFFECT OF FLUORINE ON THE CHICKEN PROVENTRICULUS. *Poultry Sci.*, 1959, 38, 1423-1425. (Dept. Poultry Sci., Purdue Univ., Lafayette, Ind.)—In 2 trials addition of NaF to the basal ration of chicks at levels of 0.08 and 0.10 per cent. F produced a significant progressive decrease in rate of growth to 6 weeks as the level of F rose. Weight of the proventriculus rose in one trial from 3.97 g. in the basal group to 5.30 and 7.20 g. in the groups given F. The ratios of proventriculus to bodyweight in the 3 groups were 0.46, 0.66 and 1.13. Histological study of the proventriculus showed that F affected mostly the surface cells. There were hypertrophy and hyperplasia of the

columnar epithelium and a thickening of the tunica propria.—J. S. Thomson. (Nutrition Abstracts & Reviews)

GRAU, C. R.
POULTRY NUTRITION RESEARCH. *Nutrition Rev.*, 1960, 18, 33-35. (Dept. Poultry Husb., Univ. California, Davis.) (Nutrition Abstracts & Reviews)

GUREVIC, G. P. Opyt obogascenija jodom jaic pri podkorme kur vodorosljami i rybnoj mukoj.
INCREASING THE IODINE CONTENT OF EGGS BY SUPPLEMENTARY FEEDING OF HENS WITH SEAWEED AND FISHMEAL. *Vop. Pitan.*, 1959, 18, No. 5, 66-70. (Inst. Epidemiol. Mikrobiol. Gigien., Vladivostok.) English summary.—After a preliminary study lasting 9 days, in which the I content of the eggs was estimated, 4 hens received daily for 20 days 1 g. seaweed containing 2.67 mg. I and the other 4 received 5 g. fishmeal with 0.117 mg. I. The eggs were collected during the feeding period and for a week after.

Before the supplements were given the mean I content of the eggs was 3.55 μg. per 100 g. With seaweed as supplement it rose rapidly to about 380 μg. per 100 g. and remained high until the supplement was withdrawn. The rise was less in the eggs from hens given fishmeal; the value reached was about 36 μg. per 100 g. and on only one day exceeded 40. More use should be made of seaweed in coastal regions.—D. Duncan. (Nutrition Abstracts & Reviews)

HALAMA, A. K. Beeinflussung der Legetatigkeit durch antibiotische und hormonale Futtersupplementierung.
EFFECT OF ANTIBIOTIC AND HORMONE SUPPLEMENTS ON LAYING. *Arch Tierernahrung*, 1959, 9, 430-439. (Beratungsburo Futterung, Vienna.)—A disorder appearing in November reduced egg yield of 2 groups of about 150 New Hampshire laying hens from 40 to about 20 per cent. Management and feeding were considered satisfactory and clinical and parasitological investigations gave no explanation for the disorder. Teramycin, 35 p.p.m., added to the laying meal of 1 group from December improved egg yield after 2 months to more than 50 per cent. Yields from the unsupplemented group remained low but improved gradually from the middle of February and when terramycin was withdrawn at the beginning of March yields were 60 and 25 per cent. Yields continued to rise according to season.

For 80 days 5 groups of 27 White Plymouth Rock × New Hampshire laying hens in batteries were given normal rations with no supplement or with, per kg. feed, 1 or 8 mg. diethylstilboestrol or 1 mg. hormone and 10 mg. terramycin or the antibiotic alone.

The antibiotic or 1 mg. diethylstilboestrol per kg. feed increased egg yields; the two together had no effect; 8 mg. hormone per kg. feed gave a slight fall of egg yield, feed intake and weight. The supplements had no effect on behaviour or health.—R. G. Hankin. (Nutrition Abstracts & Reviews)

HASKIN, V. V., and **I. Ja. TICKIJ.** Kombinirovannyj silos dlja sel'skohozjaistvennoj pticy.
MIXED SILAGE FOR POULTRY. *Pticevodstvo*, 1959, No. 8, 7-11. The silages compared were made with combinations of two or three of the following: wax-ripe maize cobs, carrots with their tops, green legumes or winter cereals, grassmeal, fodder beet and potatoes. The composition of the silages is tabulated in terms of protein, fat, fibre, ash, N-free extract, digestible protein, digestible nutrients and carotene. The fresh matter contained from 13.2 to 23.5 per cent. digestible nutrients and 1. 9 to 3.2 per cent. digestible protein. The silages could form 20 to 30 per cent. of the nutrient value of the ration. Amounts recommended for different classes of poultry, in g. daily, were for hens 50 to 60, ducks 200 to 250, turkeys 150 to 200 and geese 200 to 300. Chickens could start with 3 to 5 g. at 20 to 30 days of age and increase to 20 to 30 g. by 2 to 3 months.—D. Duncan. (Nutrition Abstracts & Reviews)

HEYWANG, B. W. and **M.G. VAVICH.**
THE EFFECT OF HIGH LEVELS OF AN ANTIBIOTIC ON EGG WEIGHT AND SHELL QUALITY DURING HOT WEATHER. *Poultry Sci.*, 1959, 38, 999-1003. (Agric. Res. Serv., U.S. Dept. Agric., Animal Husb. Res. Div., Glendale, Ariz.)—In 3 experiments groups of White Leghorn laying pullets were given, for a preliminary period of 15 days, and all-mash ration and for or a subsequent period of 35 days the same ration alone or supplemented with 50, 100 or 200 g. chlortetracycline per ton. During the preliminary period average air temperature was from 78° to 85° F. and during the experimental period from 83° to 91° F.

The antibiotic had no effect at any level on weight or quality of egg as measured by the ratio of dried shell weight to weight of whole egg.—J. S. Thomson (Nutrition Abstracts & Reviews)

HOIE, J., and **F. Sannan.** Forsok med mjolfor og pellets (pressfor) til kyllinger og verpehoner.
EXPERIMENTS WITH MASH AND PELLETED FEED FOR CHICKENS AND LAYING HENS. *Meld. Norges Landbrukshogsk.*, 1959, 38, No. 13, pp. 39. English summary.—In a preliminary trial with 160 White Italian × Rhode Island Red day-old chickens weight gains and feed efficiency were slightly, but not significantly, better in those given pellets than in those given meal of the same composition for 6 weeks. In a trial with 180 White Italians for 8 weeks gains and feed intake were higher on pellets and lower on reground pellets than on meal. Feed efficiency was slightly better on meal than on either of the other 2 forms. In 2 trials with a total of 432 White Italians for 8 weeks with 4 different feed mixtures, chickens given the feed as pellets had higher weight gains and feed intake than those given meal or heated meal. There was no significant difference in feed efficiency. Aureomycin, 15 mg. per kg. feed, increased weight gains of chickens when added to meal or heated meal but not when added to pellets.

The more rapid growth rate of chickens on pellets in all trials was most apparent during the first 4 weeks. Feed intake and average gain to 6 or 8 weeks were positively correlated, $r = 0.93$ to 0.98. The particle size of the different feeds was calculated and a negative correlation was found between the percentage of the feed particles less than 1 mm. and weight gain in g.

All feeds used in these trials gave satisfactory results and were of good quality.

In a trial lasting 8 months with 120 Rhode Island Red laying hens given as grain 50 g. whole maize and later half maize and half wheat, those receiving laying meal as pellets had larger eggs, greater feed intake, greater feed intake per kg. eggs and smaller weight loss than those getting normal laying meal; the differences were not significant. Total egg production was similar in both groups, slightly, but not significantly, higher towards the end of the trial period in those getting pellets. There was no significant difference in mortality or health.—R. G. Hankin. (Nutrition Abstracts & Reviews)

HUBER, W. G., G. L. WAXLER, M. W. MOELLER, and **H. M. SCOTT.**
EFFECT OF DIETARY ZINC DEFICIENCY OF CHICKEN HEPATIC CELLS. *Proc. Soc. Exp. Biol. Med.*, 1959, 101, 758,-760. (Illinois Agric Exp. Stat., Urbana.)—Chicks were fed on a purified diet with soya bean protein, containing 13 p.p.m. zinc; controls received 40 p.p.m. Zn. After 14 days heart, spleen, liver, kidney and small intestine were examined for histopathological changes, which were found only in liver. The nucleoli in liver cells of birds on the deficient diet were considerably larger than those of control birds.—E. Hobson. (Nutrition Abstracts & Reviews)

Huhnerdung als Huhnerfutter in Brasilien.
POULTRY DROPPINGS AS POULTRY FEED IN BRAZIL. *Deutsch. Wirtschaftsgeflugelzucht*, 1960, 12, 57.—Japanese poultry farmers in Brazil prepare a mixture of, in kg., poultry droppings 50, finely chopped hay 20, black humus earth 10, wheat bran 10 and dried sugar cane 10. If no sugar cane is available more wheat bran may be

used. Water, 60 kg., is added and well mixed. The mixture, allowed to ferment under jute sacks for a week, is then mixed with a normal laying meal in the proportion of 7 : 3 and given to laying hens, chickens or fattening cockerels. Supporters of the practice claim that almost all the bacteria and causative agents of disease present in the droppings are destroyed during fermentation and that the few which survive help to build up resistance in the poultry.—R. G. Hankin. (Nutrition Abstracts & Reviews)

Huhnerweiden.

PASTURE FOR POULTRY. *Deutsch. Wirtschaftsgeflugelzucht*, 1959, 11, 1006. —The pasture area available should be divided into 4 parts, each given over to a cereal crop, preferably summer barley, every fourth year. The remaining 3, of clover pasture, should each be used for 1 and rested for 2 weeks in rotation. Actual grazing area per bird should be about 5 sq.m.—R. G. Hankin. (Nutrition Abstracts & Reviews)

JANECEK, H. M., R. SUZUKI, and **A. C. IVY.**

ENDOGENOUS EXCRETION AND CAPACITY TO ABSORB DIETARY CHOLESTEROL IN THE CHICKEN. *Amer. J. Physiol.*, 1959, 197, 1341-1344. (Dept. Clin. Sci., Univ. Illinois. Coll. Med., Chicago.) Faecal elimination of endogenous cholesterol in 12 cockerels, aged 14 to 16 weeks and weighing on average 1900 g., on cholesterol-free diet containing 3 per cent. cottonseed oil, was 20 mg. per day when correction was made for intake of phytosterol. Intake was 280 Cal. and thus the ratio of Cal. required for maintainance to endogenous cholesterol output was 14 : 1.

The capacity to absorb cholesterol from food was 210 mg. per day in 12 cockerels, aged 16 to 21 weeks and weighing on average 2100 g., when intake was 916, 920 or 1145 mg. daily for 7 days. The capacity to absorb was the same when average weight was 1900 and 2400 g., indicating that the intestine had reached maturity by average bodyweight 1900 g. The ratio of Cal. required for maintenance to intestinal capacity to absorb cholesterol in birds of 2100 g. was 1.33 : 1.

Serum cholesterol was significantly increased after ingestion of 85 mg. cholesterol daily for 7 days, 4 times the endogenous faecal output.—G. F. Garton. (Nutrition Abstracts & Reviews)

JOWSEY, J. R., R. M. BLAKELY and **H. I. MacGREGOR.**

EFFECT OF THIOCTIC ACID ON GAIN IN BODYWEIGHT BY TURKEY POULTS. *Nature*, 1959, 184, Suppl. No. 17, 1323-1324. (Res. Branch, Canada Dept. Agric., Swift Current, Sask.)—Thioctic acid, 7 mg. per kg., was added to a practical starting ration for poults, containing ground wheat and barley, soya bean meal, fishmeal, meat scrap, alfalfa meal, vitamins, minerals and procaine penicillin. In 6 trials with Broad Breasted Bronze poults no significant difference in bodyweight at 6 weeks of age was found between those given thioctic acid and those not given it.—R. G. Hankin. (Nutrition Abstracts & Reviews)

KIENHOLZ, E. W., L. S. JENSEN, and **J. McGINNIS.**

IMPROVEMENT IN NUTRITIONAL VALUE OF PEAS BY COOKING. *Proc. Soc. Exp. Biol. Med.*, 1959, 102, 35-38. (Dept. Poultry Sci., Washington State Univ., Pullman.)—The cooking or autoclaving of peas, *Pisum sativum*, which were supplemented with methionine and vitamins and given to chickens and turkey poults resulted in a marked increase in feed utilisation and growth.

When the energy content of the ration containing raw peas was increased by the addition of up to 20 percent. tallow, the increase in feed utilisation was not as great as observed with cooking.

It has been suggested that heating destroys an unknown growth inhibitor present in the peas.

The response to the cooking of peas in the diets of rats was a significant increase in growth of males and a slight decrease in that of females.—M. E. Falconer. (Nutrition Abstracts & Reviews)

KRATZER, F. H., and P. N. DAVIS.
THE FEEDING VALUE OF MEAT AND BONE MEAL PROTEIN. *Poultry Sci.*, 1959, 38, 1389-1393. (Dept. Poultry Husb., Univ. California, Davis.)—In 18 experiments with chickens 1 week old 10 different samples of meat-and-bone meal were used as the sole source of protein, apart from that obtained from 2 per cent. fish solubles. The experiments lasted for 10 to 11 days. Improved growth could be obtained by supplementing the meals with tryptophan and increasing, as methionine or cystine, the total content of S-amino acids, although there was no deficiency of methionine. There was no evidence that the meals were deficient in lysine, leucine, valine or arginine. One sample which contained bloodmeal was deficient in *iso*leucine. In some instances growth on the supplemented rations was less than that when a mixture of soya bean meal and fishmeal was given and the reason for this is not known.—J .S. Thomson. (Nutrition Abstracts & Reviews)

KRATZER, F. H., P. VOHRA, R. L. ATKINSON, P. N. DAVIS, B. J. MARSHALL, and J. B. ALLRED.
FRACTIONATION OF SOYBEAN OIL MEAL FOR GROWTH AND ANTIPEROTIC FACTORS. 1. NON-PHOSPHOLIPID NATURE OF THE FACTORS. *Poultry Sci.*, 1959, 38, 1049-1055. (Dept. Poultry Husb., Univ. California, Davis.)—1. Ten experiments with turkey poults are reported. The reference ration contained Drackett protein as the sole source of protein, supplemented with minerals and vitamins. In the experimental rations Drackett protein was replaced by commercial solvent-extracted soya bean meal or this meal further extracted with methanol, and methanol or acetone extracts and other growth-promoting substances were evaluated also.

Compared with Drackett protein, soya bean oil-meal, re-extracted or not, gave a growth response higher by from 50 to 80 per cent. and also reduced the incidence of perosis; the methanol extract gave an increase of from 30 to 50 per cent. and also reduced the incidence of perosis. Previous work (Abst. 1714, Vol. 29) had shown that part of the growth-promoting and antiperosis effect of soya bean meal was due to its Zn content, and this was confirmed when 0.01 per cent. $ZnCl_2$ added to the Drackett protein ration produced a growth increment of 36 and 72 per cent. in 2 experiments and also reduced the incidence of perosis. The methanol-insoluble fraction of the acetone-insoluble portion and the acetone-insoluble fraction of the methanol extract each increased the growth rate by about 40 per cent. and reduced the incidence of perosis, but the ash of these fractions had no effect, indicating that the growth factor is organic. Contrary to the findings of Reid *et al.* (see Abst. 5945, Vol. 27) addition of Mo had no effect. Dried whey, egg yolk, brain powder and liver powder added to the Drackett protein ration all showed growth and anti-perosis activity but phospholipid fractions of egg yolk and brain powder and the lecithin and cephalin fractions of a soya bean phospholipid had little or no effect, most of the growth activity being found in the residues after extraction. Inositol, linoleic acid and choline also had no effect. It is concluded that the growth-promoting effect of soya bean is due in part to its Zn content and to an organic fraction, not phospholipid in nature, which is present chiefly in the acetone-insoluble fraction of the methanol extract.—J. S. Thomson (Nutrition Abstracts & Reviews)

KIVIMAE A. Orienterande forsok med skordeskadad spannmal till fjaderfa.
TRIALS WITH HARVEST-DAMAGED GRAIN AS FEED FOR POULTRY. *Kungl. Lantbrukshogsk. Statens Husdjursforsok Sartryck* No. 135, 1959, pp. 17. German summary.—In 2 trials with White Leghorn chickens and one with laying hens mixed barley and oat grain and wheat extensively damaged by summer rains were compared with normal mixed grain harvested the previous year. The damaged and undamaged grains did not differ in chemical analysis. Total tocopherol in damaged cereals was 40 to 43 mg. per kg. compared with 15 mg. in normal mixed grain after a year in storage; values fell as winter progressed.

In the first trial, in which the cereals made up 35.4 per cent. of the

rations, chickens given supplements of 1 per cent. liver oil or 22 g. terramycin per metric ton feed showed the best weight gains and feed efficiency. Tocopherol added to normal grain gave no improvement. There was no significant differences between normal and damaged cereals.

In the second trial Evitamix, supplying 2.5 I.U. vitamin E per g., 0.6 per cent., or liver oil 0.33 per cent., or both or no supplement was added to rations containing 35.6 per cent. damaged mixed grain or wheat; in addition other groups had terramycin, 22 g. per ton, or liver oil, 0.275 per cent., added to the feed. Growth rates and feed efficiency were better than in the first trial but differences between the groups were not significant. Chickens given terramycin had the highest gains and best feed efficiency.

In the trial with laying hens 24.4 or 48.8 per cent. of the ration as damaged grain had no apparent effect on egg production, health or hatchability.

Because of wide variations in harvest methods between farms and between types of grain the results obtained cannot be applied to all harvest-damaged grains.—R. G. Hankin. (Nutrition Abstracts & Reviews)

KRITCHEVSKY, D., R. R. KOLMAN, R. M. GUTTMACHER, and M. FORBES.

INFLUENCE OF DIETARY CARBOHYDRATE AND PROTEIN ON SERUM AND LIVER CHOLESTEROL IN GERM-FREE CHICKENS. *Arch Biochem. Biophys.*, 1959, 85, 444-451. (Wistar Inst. Anat. Biol., Philadelphia, Pa.)—Normal and germ-free chickens received a sterilised diet containing cholesterol 3, casein 25 and carbohydrate 54 per cent. The carbohydrate was starch, glucose or sucrose. After 28 days the chickens were killed and cholesterol was estimated in blood and liver.

Both glucose and starch produced lower cholesterol values than sucrose in normal birds. In germ-free birds the difference was less. Growth was better with glucose than with sucrose, and with glucose the germ-free chickens grew better than normally reared birds.

When changes were made in dietary protein and the carbohydrate was starch, chickens given Promine, a soya bean protein, had lower serum cholesterol values than those given casein. In both groups of germ-free chickens serum cholesterol levels were higher than in the normal birds. The diet was supplemented with choline and methionine for all groups, so the low S content of the soya protein did not account for its effect.—A. Crossland. (Nutrition Abstracts & Reviews)

LANDAU, L., V. PETER, and A. SPRONC. Porovnanie ucinku nuteneho dokrmu moriek s dokrmom vol 'nym sypanim.

COMPARISON OF EFFECTS OF FORCED AND FREE FEEDING OF TURKEYS. *Pol'nohospodarstvo*, 1959, 6, 713-724. (Inst. Poultry Rearing, Ivanka pri Dunaji.) English and Russian summaries.—A group of 7 turkeys was fed to appetite and a comparable group was force-fed by means of a special pump. The group force-fed had a daily weight gain greater by 22 per cent., and was more uniform than that fed to appetite. The feed per g. weight gain was 6.2 g. with force feeding and 5.93 g. with feeding to appetite. The higher feed consumption and extra work required for feeding with the pump was offset by the greater profit, because the force-fed turkeys had a better quality of meat.—M. Proksova (Czechoslovakia). (Nutrition Abstracts & Reviews)

LEONG, K. C., M. L. SUNDE, H. R. BIRD, and C. A. ELVEHJEM.

INTERRELATIONSHIPS AMONG DIETARY ENERGY, PROTEIN, AND AMINO ACIDS FOR CHICKENS. *Poultry Sci.*, 1959, 38, 1267-1285. (Univ. Wisconsin, Madison.)—Chickens were given to appetite diets containing one of 3 levels of energy and differing protein levels. The variations were made by altering the maize, Cerelose with cellulose, inedible pork fat and protein mixture in the diets. The protein mixture consisted of 1 part fishmeal, 1 part gelatine and 3 parts crude casein.

With crude protein from 17 to 42 per cent., by 5 per cent. intervals,

and productive energy 950, 1210 or 1450 Cal. per lb. feed, the protein requirement rose with energy so that with 1210 Cal. 29 per cent. protein, and with 950 Cal. 27 per cent. protein was optimum. This was true whether or not the diets were supplemented with methionine and creatine hydrate.

The optimum ratio of Cal. per lb. to percentage protein also rose with energy in the diet. Feed conversion was affected in the same way. Deposition of visceral fat was influenced by protein level on diets with 1210 Cal.; it fell off with rising protein percentage. With 1450 Cal. all birds were uniformly fat and with 950 Cal. fat deposition was uniformly low. Thus fat content of the diet was more important than the energy : protein ration. Increase of energy in the diet required an increase in protein.

With methionine supplementation, arginine was found to be the most limiting amino acid. The requirement for methionine plus cystine increased with protein, and total S-amino acid requirements increased similarly and also with increase of productive energy in the diet at higher levels of protein. Creatine hydrate with methionine was an effective substitute for arginine. Optimum levels of methionine were investigated. Balancing the diet with amino acids affected growth response, energy : protein ratio and protein requirements and utilisation of protein was improved.

When energy in the diet increased, ether extract of the carcase rose with an accompanying fall in water content. With the lowest percentage protein in the diet the protein content of the carcase was negatively correlated with its ether extract.—J. G. Gordon. (Nutrition Abstracts & Reviews)

LEPKOVSKI, S., E. BINGHAM, and R. PENCHARZ.

THE FATE OF THE PROTEOLYTIC ENZYMES FROM THE PANCREATIC JUICE OF CHICKS FED RAW AND HEATED SOYBEANS. *Poultry Sci.*, 1959, 38, 1289-1295. (Dept. of Poultry Husb., Univ. California, Berkeley.)—The method of estimating proteolytic enzymes in the faeces of chicks was that of Northrup and Kunitz (*J. Gen. Physiol.*, 1932, 16, 313). Fractionation of the faeces showed that a considerable amount of the proteolytic activity was persent as insoluble complexes. Proteolytic activity of faeces was highest when birds were 1 week old and decreased irregularly until at 14 weeks of age it was only one-fifth of that at 1 week. When the pancreatic ducts were ligated proteolytic activity completely disappeared from the faeces, indicating that proteolytic enzymes in the faeces are of pancreatic origin. The chicks with ligated ducts excreted considerably more faeces. Proteolytic activity of the faeces was similar in germ-free and in normal chicks. After introduction of proteolytic enzymes, in the form of beef pancreas, into the duodenum of chicks with ligated pancreatic ducts the faeces had little proteolytic activity, so there was considerable destruction in the intestinal tract. With heat-treated soya beans in the rations there was a very gradual fall of proteolytic activity per unit of faeces, even when methionine also was added; in chicks not given methionine the total proteolytic activity of the 24-hr. samples of faeces fell but in those given methionine there was no fall because of the larger increase in weight of faeces. A change from heated to raw soya beans resulted in a sharp decrease of proteolytic activity in the faeces, followed after 2 weeks by a slight rise. Methionine added to the raw soya bean ration increased the proteolytic activity of the faeces over that with unsupplemented raw soya beans, a result contrary to that obtained by Chernick *e al.* (Abst. 1034, Vol. 19).—J. S. Thomson. (Nutrition Abstracts & Reviews)

LEVEILLE, G. A., and H. FISHER.

AMINO ACID REQUIREMENTS FOR MAINTENANCE IN THE ADULT ROOSTER. 2. THE REQUIREMENTS FOR GLUTAMIC ACID, HISTIDINE, LYSINE AND ARGININE. *J. Nutrition*, 1959, 69, 289-294. (Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.) For part 1 see Abst. 4127, Vol. 29—2. Cockerels, 12 months old, maintained on a complete diet containg free amino acids, were used. The

requirement for an amino acid was taken to be the amount necessary to maintain the level of N excretion observed on the complete diet. The minimum maintenance level was taken as the lowest level of an amino acid required to maintain positive N balance. L-Glutamic acid and L-histidine were not essential. The requirement for L-lysine was very low, 29 mg. per kg. bodyweight per day. Even in complete absence of lysine from the diet, the birds were not in negative N balance. The requirement for L-arginine, 120 mg. per kg., was much higher than for any amino acid hitherto studied. Th minimum maintenance level was 54 mg. The high arginine requirement may be due in part to the demand for keratin synthesis in feather replacement, since feathers contain, per 16 g. N, 8.0 g. arginine, and only 1.8 g. lysine.—E. M. Cruickshank.—(Nutrition Abstracts & Reviews)

LEVEILLE, G. A., A. S. FEIGENBAUM, and **H. FISHER.**
THE EFFECT OF DIETARY PROTEIN, FAT AND CHOLESTEROL ON PLASMA CHOLESTEROL AND SERUM PROTEIN COMPONENTS OF THE GROWING CHICK. *Arch Biochem. Biophys.*, 1960, 86, 67-70. (Dept. Poultry Sci., Rutgers Univ., New Brunswick, N.J.)—Cockerels 2 weeks old were fed freely on a basal diet with, per cent., protein 10.4, fat 0.15, methionine 0.23 and choline 0.20; soya bean oilmeal 30 was added at the expense of glucose for high-protein groups. Coconut oil or maize oil was added at 10 per cent. in one experiment and at 5 per cent. in the other. When cholesterol was added it was at 2 per cent. in high-protein and at 3 per cent. in low-protein diets. At the end of 5 weeks birds were bled by heart puncture, plasma cholesterol was estimated and serum protein was studied by paper electrophoresis.

Growth was depressed by the low-protein diets, and on the high-protein diet with coconut oil. Coconut oil was less well used than maize oil in an otherwise balanced diet. All birds on low-protein diets showed significantly higher plasma cholesterol levels and lower serum total protein and albumin levels, with a higher albumin : globulin ratio, than birds on comparable diets with the high level of protein. The chicks given coconut oil had much higher plasma cholesterol values than those on maize oil or combinations of coconut with cottonseed or safflower oil. The serum total protein level was not influenced by type of fat or cholesterol. Cholesterol increased the α_2+$_2$-globulin but did not influence other globulin fractions. The precentage of lipid bound to β-lipoprotein was higher on low-protein than on high-protein diets, and birds given cholesterol had more β-lipoprotein-bound lipid than those not given cholesterol. With any type of fat, the greatest increase of β-lipoprotein-bound lipid was obtained when cholesterol was added to a low-protein diet.—A. Crossland. (Nutrition Abstracts & Reviews)

LIN, T. M., E. KARVINEN, and **A. C. IVY.**
EFFECT OF STEARIC ACID AND CHOLESTEROL ON BIOSYNTHESIS OF STEROL BY THE CHICKEN LIVER. *Amer. J. Physiol.*, 1960, 198, 29-32. (Dept. Clin. Sci., Univ. Illinois Coll. Med., Chicago.)—Cockerels 1 week old received a basal diet of commercial mash containing protein 22, fat 3 and sterol 0.05 per cent.; the sterol supplied 5 mg. cholesterol and the rest was phytosterol. One group received no supplement, others had 10 per cent. stearic acid, or cholesterol 1 per cent. for 10 weeks and 2.5 per cent. for 6 weeks, or both. After they had been freely fed for 16 weeks the birds received 10 μC. acetate-1-^{14}C intraperitoneally and were killed 3 hr. later.

The amount of labelled cholesterol in the liver after injection of acetate was 78 per cent. less in birds given the cholesterol supplement than in those on the basal diet, but was 136 per cent. more in those given stearic acid alone. The effect of stearic acid with cholesterol was exactly the same as that of cholesterol alone.

In discussion it is emphasised that although the diet contained more cholesterol than could be absorbed, and the dietary cholesterol inhibited cholesterol formation in the liver, the degree of inhibition was considerably less than is given in the literature for other species *(e.g.*, Absts. 4784. 4785, Vol. 23).—D. Duncan. (Nutrition Abstracts & Reviews)

LOBIN, N. V. Ispol'zovanie othodov hlopkovodstva v korm ptice.
USING BY-PRODUCTS OF THE COTTON INDUSTRY IN POULTRY FEEDING. *Pticevodstvo*, 1959, No. 7, 26-27. (Nutrition Abstracts of Reviews)

LOCKHART, W. C., and R. L. BRYANT.
HIGH AND LOW ENERGY DIETS FOR CHICKS. *N. Dakota Farm Res.*, 1958, 20, No. 6, 15-19.—As the ratio of Cal. metabolisable energy per lb. to percentage protein in the diet increased from 60 : 1 to 62 : 1, efficiency of feed utilisation increased. A calorie : protein ratio of 59 : 1 was too low and 72 : 1 too high for maximum efficiency during the first 6 weeks of life. A ration containing 1.5 per cent. fat and 22 per cent. protein produced the largest chickens as well as the best efficiency. A ration with 2 per cent. dried milk in addition to meatmeal and fishmeal gave good growth and was better than all other rations in efficiency. Neither dried whey nor dried grain fermentation solubles was a satisfactory substitute for dried milk.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

MAENNEL, K.
THE FEEDING OF PEKIN DUCKS. *Farming in S. Africa*, 1959, 35, No. 8, 21. (Coll. Agric., Potchefstroom.) (Nutrition Abstracts & Reviews)

MANTEL, K., and A. PRILL. Terramycin in verschieden hoher Gabe im Legemehl und im Trinkwasser verabreicht an Legehennen.
TERRAMYCIN AT DIFFERENT LEVELS IN LAYING MEAL AND IN DRINKING WATER FOR LAYING HENS. *Arch Geflugelk.*, 1959, 23, 384-391. (Geflugelzuchtlehranst. Oberbayern, Erding.) English summary.—In 2 trials lasting 350 days groups of 30 Leghorn laying hens, average weight 1.71 kg., were given daily 50 g. mixed grain and laying meal to appetite. In the first trial 0, 25, 50 or 100 g. terramycin per metric ton was added to the laying meal. The groups getting 50 and 100 g. terramycin, in that order, had the highest egg yields and weight gains; 25 g. had no effect. Feed efficiency was best with 50 g. Feed costs increased with rise in terramycin but, per 100 g. eggs, costs were lowest with 50 g. With 25 or 100 g. terramycin cost per 100 g. eggs was silghtly higher than on the ration with no terramycin.

In the second trial no terramycin or terramycin equivalent to 50 or 100 g. per ton laying meal was added to the drinking water throughout or equivalent to 300 mg. given at intervals. The rations with 50 and 100 g. terramycin gave slightly better egg yield and weight gains and that with 50 g. slightly better feed efficiency. The ration with 300 g. per ton given at intervals was in general inferior to that with no supplement.

Losses varied widely between the groups but were not related to feeding.—R. G. Hankin. (Nutrition Abstracts & Reviews)

MARCH, B. E., J. BIELY, H. L. A. TARR, and R. A. MacLEOD.
THE USE OF CONDENSED HERRING SOLUBLES IN TURKEY POULT RATIONS. *Fish Res. Board Canada, Progr. Rep. Pacific Coast Stat.*, 1959, No. 113, 3-5. (Dept. Poultry Sci., Univ. British Columbia, Vancouver.)—In the first experiment poults were fed from day-old to 6 weeks. The basal ration had 10 per cent. herring meal. Experimental groups got condensed herring solubles or dried brewer's yeast, each 1.5 or 3.0 per cent. Both levels of solubles improved growth, but the yeast did not.

In 2 further experiments with poults fed to 6 or 9 weeks there were 2 basal rations in each. They had no fishmeal, but vitamin B_{12} was added, and the cereal was ground feed screenings or ground maize. Supplements of 3 per cent. solubles or yeast were added to each basal ration for the experimental groups. Both improved growth, and at 9 weeks yeast was almost as good as solubles.

All the basal diets had supplementary riboflavin, nicotinic acid and calcium pantothenate. It was thought that the condensed herring solubles supplied other components of the vitamin B complex, and when

it is used dried brewer's yeast need not be given.—T. D. Bell (Nutrition Abstracts & Reviews)

MARCH, B. E., and J. BIELY (with **J. TOTHILL** and **S. A. HAQQ.**)

DIETARY MODIFICATION OF SERUM CHOLESTEROL IN THE CHICK. *J. Nutrition*, 1959, 69, 105-110. (Poultry Nutrit. Lab., Univ. British Columbia, Vancouver.)—Groups of 22 chicks were given diets containing 20 or 26 per cent. protein, with or without 8 per cent. added fat. The iodine values of the fats were used: herring oil 137, maize oil 127, Crisco 74, lard 62, butter 32, chicken fat 78. Serum cholesterol was estimated after 4 to 5 weeks. Then chicks from each group were then given cholesterol as 1 per cent. of the diet, and serum cholesterol was again estimated 48 hr. later.

Serum cholesterol was higher in chicks given the lower level of protein, whatever the amount or type of fat. At both levels of protein, Crisco, lard, butter and chicken fat increased serum cholesterol. Maize oil did so only when the diet contained 20 per cent. protein. Herring oil was without effect. Cholesterol added to the diet increased serum cholesterol in all instances, more in chicks given added fat. Chicks given the higher level of protein, without added fat, had heavier thyroids relative to bodyweight. There was a significant negative correlation between thyroid size and serum cholesterol value.—E. M. Cruickshank. (Nutrition Abstarcts & Reviews)

MORIMOTO, H., M. YOSHIDA, and **H. HOSHII.**

PREPARATION OF A PURIFIED RATION FOR CHICKS. 1. MANGANESE DEFICIENCY IN A SEMI-PURIFIED RATION. *Bull. Nat. Inst. Agric. Sci., Japan* (G), 1959, No. 18, 15-22. In Japanese : English summary.—1. A semi-purified diet with fishmeal as the only source of protein and 10 p.p.m. Mn did not give satisfactory growth of chickens from day-old to 4 weeks, and most of the birds developed perosis. When 0.2 per cent. manganese sulphate was added, raising the total Mn to 63 p.p.m., growth was as good as on a conventional starter mash, and there was no perosis.

A semi-purified diet similar to the first, but with soya bean meal as the protein and 29 p.p.m. Mn, growth was almost as good as in controls, but some perosis occurred. When the Mn content was raised to 70 p.p.m. growth was better than on the conventional mash. The Mn requirement of the White Leghorn chickens used was thought to lie between 30 and 60 p.p.m. diet.—T. D. Bell. (Nutrition Abstracts & Reviews

NELSON, T. S., and **L. C. NORRIS.**

FACTORS AFFECTING THE VITAMIN K REQUIREMENT OF THE CHICK. *Poultry Sci.*, 1959, 38, 1094-1102. (Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.)—The chicks used had been reared to 4 weeks of age on a purified diet containing 0.05 mg. menadione per 100 g. At 30 days they were given for 3 weeks a basal diet deficient in vitamin K, of yellow maize, soya bean oilmeal, minerals and vitamins, and blood clotting time was measured at intercvals. In 2 experiments clotting time rose rapidly and in one there was a high incidence of haemorrhage. Adding 0.1 or 0.125 per cent. sulphaquinoxaline further prolonged clotting time. Clotting time was normal when from 0.25 to 10 mg. menadione sodium bisulphite per 100 g. was added to the basal diet and haemorrhage was prevented; the lower amount was as effective as the higher. Menadione added to the diet containing sulphaquinoxaline prevented the increase of clotting time but did not always prevent haemorrhage. The higher level of sulphaquinoxaline retarded growth and increased mortality and the further addition of menadione did not entirely overcome the depression of growth. Addition to the basal diet of 0.0125 per cent. nicarbazin, 0.01 per cent. arsanilic acid, 0.0055 per cent. aureomycin or 0.005 per cent. arsonic acid, or a combination of these, slightly prolonged clotting time after 2 to 3 weeks on experiment, but the effect was reversed by further addition of menadione.

In one experiment with these drugs in which the chicks were given a bronchitis vaccine in the drinking water it was found that in those receiving menadione clotting time was normal; in those receiving nicar-

bazin, arsanilic acid, aureomycin or a combination of these, clotting times were higher in chicks on the basal diet. Again the effect was temporary and clotting time became normal when the chicks recovered.—J. S. Thomson. (Nutrition Abstracts & Reviews)

NOZAKI, H., S. HORII, and Y. TAKEI.
METABOLISM OF P AND Ca IN LAYING HENS GIVEN RATIONS DEFICIENT IN P OR Ca AND P. *Bull. Nat. Inst. Agric. Sci., Japan* (G), 1959, No. 18, 169-177. In Japanese : English summary. (Nutrition Abstracts & Reviews)

OCAKOVSKIJ, V. S. Primenenie fosfatidov pri otkorme kur.
PHOSPHATIDES FOR FATTENING HENS. *Pticevodstvo*, 1959, No. 8, 15-16. (Inst. Pisc. Prom., Krasnodar.)—The phosphatides tested were obtained as a by-product in purification of sunflower and soya oils. When the product was added to all-plant chicken rations at from 1.5 to 3.0 g. per kg. bodyweight weight gains were increased, feed utilisation was improved and the precentage of first class meat was considerably increased. Best results were with 2 per cent. phosphatides.—D. Duncan. (Nutrition Abstracts & Reviews)

OLSSON, N. Forsok med methionin och antibiotika till slaktkycklingar.
METHIONINE AND ANTIBIOTIC SUPPLEMENTS IN FEEDS FOR BROILERS. *Kungl. Lantbrukshogsk. Statens Husdjursforsok Sartryck* No. 133, 1959, pp. 22. English summary.—Four groups of 60 White Plymouth Rock chickens were given a broiler mash with 25 g. DL-methionine per 100 kg. feed alone or with procaine penicillin 5, or terramycin 10 g. per ton feed or the broiler ration with the terramycin but no added methionine. Average total gains to 11 weeks were 1312, 1441, 1551 and 1551; feed intakes per kg. gain were 3.29, 3.21, 3.05 and 3.11 kg. The effect of the supplements was seen only in the first 4 weeks. Yield of dressed carcase ranged from 66.6 to 69.4 per cent.; there was no significant difference between the groups. All birds slaughtered were of the best quality.—R. G. Hankin. (Nutrition Abstracts & Reviews)

OWINGS, W. J., and S. L. BALLOUN.
RELATION OF ARGININE AND LYSINE TO FEATHER TYROSINASE ACTIVITY. *Poultry Sci.*, 1959, 38, 1285-1289. (Dept. Poultry Husb., Iowa State Univ. Sci. Technol., Ames.)—The basal diet, deficient in lysine and arginine, used with New Hampshire chickens contained Cerelose, zein and casein supplemented with glycine, tryptophan, methionine, vitamins and minerals, protein content 24.6 per cent. Lysine was added to give levels of 0.6 to 1.3 per cent. and at each lysine level the arginine content rose from 0.4 to 1.7 per cent.

Growth was poor at all levels of lysine when the arginine level was 0.4 per cent. and was poor also at all arginine levels when the lysine content was 0.6 per cent. At higher lysine levels, 0.9 to 1.3 per cent., the addition of higher levels of arginine improved growth rate, higher lysine levels requiring higher amounts of arginine for maximum growth.

At the lowest level of lysine, with 1.0, 1.2 and 1.5 per cent. arginine, chickens showed white feathers, but with 1.7 per cent. arginine only moderate feather depigmentation was found regardless of the lysine content, while at the lowest arginine level, 0.4 per cent., no depigmentation was found at any lysine level, possibly because of slow growth. One case of depigmentation was noted with 1.1 per cent. lysine and 1.0 per cent. arginine and it is suggested that other amino acids may be concerned in the development of depigmentation.

Tyrosinase activity of the feathers was low in birds showing depigmentation and generally increased as the level of lysine rose and it is concluded that lysine deficiency causes feather depigmentation by inhibiting the activity of the tyrosinase and preventing the formation of melanin pigment.—J. S. Thomson. (Nutrition Abstracts & Reviews)

PETERSEN, C. F., and R. E. BLACK.
POULTRY FEED FORMULATION, *Univ. Idaho Coll. Agric. Bull.* No. 304, May 1959, pp. 15. (Nutrition Abstracts & Reviews)

PETERSON, I. O. Primenenie novyh antirahiticeskih sredstv v pticevodstve.

USE OF NEW ANTIRACHITIC SUBSTANCES IN POULTRY HUSBANDRY. *Sborn. Trud. Latv. Inst. Zivot. Vet.*, 1958, 9, 115-124.—Activity of vitamin D preparations was estimated from liveweight gain, Ca, P and phosphatase in serum, percentage of ash in bone and uptake of ^{45}Ca by bone of poultry; results of several experiments are tabulated. Crystalline vitamin D_2 in alcoholic solution had only one-thirtieth of the activity of vitamin D_3 in oil or cod liver oil, and vitamin D_2 in oil had one-fifteenth to one-twentieth of the activity of vitamin D_3. All the preparations tested gave good liveweight and egg production. On the other hand, hatchability of eggs was much poorer when the hens had cod liver oil than when they had vitamin D_3 in alcohol or vitamin D_2 in oil.

For prevention of rickets in chicks the amounts of vitamin needed per 100 g. feed were 20 I.U. vitamin D_3 in any form, 600 I.U. crystalline vitamin D_2 or 200 I.U. vitamin D_2 in oil. Hens in winter require 100 I.U. vitamin D_3 or 3000 I.U. vitamin D_2 in oil daily, and 50 per cent. more for 2 or 3 weeks before eggs are to be taken for incubation.

All the vitamin D preparations maintained their activity when they were mixed with a standard feed mixture and stored at room temperatire for 2½ months, but longer tests are called for.—D. Duncan. (Nutrition Abstracts & Reviews)

PREVO, A. A. Soevye boby—cennyj istocnik belka dlja ptic.

SOYA BEANS ARE A VALUABLE SOURCE OF PROTEIN FOR POULTRY. *Pticevodstvo*, 1959, No. 8, 13-15.—Soya beans grow particularly well in the Soviet Far East and in Western Siberia. Composition is tabulated for two varieties of soya bean, soya bean cake and meal, green plants and hay, with other feeds of the same classes for comparison. It is recommended that not more than 20 to 25 per cent. of the protein feeds in the ration of poultry should be soya products.—D. Duncan. (Nutrition Abstacts & Reviews)

QUERNER, H., and **J. STAUFENBIEL.** Uber die Verwendung von Terramycin in der Legehennenfutterung bei Batteriehaltung.

USE OF TERRAMYCIN FOR FEEDING LAYING HENS IN BATTERIES. *Arch Geflugelk*, 1959, 23, 392-403. (Lehr-Versuchsanst. Geflugel-Kleintierzucht, Krefeld-Grosshuttenhof.) English summary.—In a trial lasting 47 weeks groups of 40 Leghorn × Rhode Island Red laying hens housed in batteries were given an all-mash ration with 0, 25 or 50 g. terramycin added per metric ton feed or with 3, 6 or 10 g. per 10 litres drinking water.

Terramycin increased egg yield by 7 to 19 per cent., most with 3 g. per 10 litres and least with 50 per ton. Feed intake was higher, up to 7.3 per cent. on 3 g. per 10 litres, in the groups getting terramycin except in that getting 50 g. per ton. Terramycin improved feed efficiency by 2.5 to 9 per cent.; 3 g. per 10 litres was best. Weight gains were 13.8 and 10.4 per cent. better in the groups getting 3 and 10 g. per 10 litres, respectively, but those of hens getting 25 g. or 50 g. per ton were only about two-thirds those of hens not getting terramycin. Losses were smallest, 15 per cent., in the groups getting terramycin in the drinking water and greatest, 40 per cent., in the group getting 50 g. per ton feed. Egg yolks were paler when 25 or 50 g. was added to the feed. Adding 10 g. terramycin per 10 litres drinking water of hens under different forms of stress improved performance.—R. G. Hankin. (Nutrition Abstracts & Reviews)

RATCLIFF, R. G., E. J. DAY, and **J. E. HILL.**

BROILER PIGMENTATION AS INFLUENCED BY DIETARY MODIFICATIONS. *Poultry Sci.*, 1959, 38, 1039-1048. (Mississippi Agric. Exp. Stat., State College.)—The feeds tested for their effect on pigmentation were yellow maize, maize gluten meal and alflafa meal with 20 per cent. protein, estimated to contain 6.7, 82.2 and 260 mg. xanthophyll per lb., respectively. The feeds were incorporated into the ration to supply equivalent amounts of xanthophyll, about 4 mg. per lb. ration.

Pigmentation was estimated from the carotenoids in the toe web area and efficiency of xanthophyll utilisation from the ratio of pigmentation to xanthophyll intake.

From the results of 2 experiments it was found that, on the assumption that all the xanthophyll in yellow maize was utilised for pigmentation, maize gluten meal and alfalfa meal had biological values of 46.5 and 30.7 per cent., respectively. A control ration containing mixtures of the 3 feeds and supplying 8.2 mg. xanthophyll per lb. ration gave no greater pigmentation than maize alone, and eficiency of utilisation was less.

With a broiler ration containing white maize and 2 per cent. alfalfa meal, alone or with 4 per cent. fat or 2 per cent. lecithin, variations in the ratios of Cal. productive energy to percentage protein from 35 to 60 : 1 had no effect on pigmentation but the efficiency of xanthophyll utilisation was always less when the ration was under 40. The rations with added lecithin gave significantly higher pigmentation than those with added fat. Widening the energy to protein ratio in the unsupplemented ration depressed rate of growth but when fat or lecithin was added widening the ratio did not.

When a comem.rcial pigment agent, Gallicol, containing 133.6 mg. xanthophyll per lb., was added to a broiler ration containing yellow maize there was no effect on pigmentation and it is concluded that the pigment was inactive. Addition of 3-nitro-4-hydroxyphenylarsonic acid, believed to increase pigmentation, had no significant effect but increased the efficiency of xanthophyll utilisation.—J. S. Thomson. (Nutrition Abstracts & Reviews)

RAUCH, W. Uber die Beeinflussung der Dotterfarbe durch carotinoidhaltiges Legehennenfutter.

THE INFLUENCE OF CAROTENOID-CONTAINING FEEDINGSTUFFS FOR LAYING HENS ON YOLK COLOUR. *Arch. Geflugelk.*, 1959, 23, 319-331. (Bundesforschungsanst. Kleintierzucht, Celle.) English and French summaries.—Two groups of 9 Leghorn hens were fed in a battery for 8 months on a complete basal diet given, during alternate periods of a few weeks, alone or with a supplement of either green lucerne meal or a carotenoid. Intensity of colour of egg yolk was measured spectrophotometrically. Although differences between eggs from individual hens were great, it was clear that yolk colour was deepened by added carotenoids, especially those in green lucerne meal, 5 or 2 per cent., or zeaxanthin as 6 mg. *iso*zeaxanthin dimethyl ether per kg. feed, less by apocarotenal and least by carotene or xanthophyll.—I. R. Anderson. (Nutrition Abstracts & Reviews)

REICHARD, P.

THE BIOSYNTHESIS OF DEOXYRIBONUCLEIC ACID BY THE CHICK EMBRYO. I. UTILIZATION OF CYTIDINE-C^{14}. 2. METABOLISM OF O^2 : 2^1-*CYCLO*URIDINE.

BOLINDER, A., and **P. REICHARD.**

3. INFLUENCE OF VITAMIN B_{12} DEFICIENCY. *J. Biol. Chem.*, 1959, 234, 1244-1248; 2719-2722; 2723-2727. (Dept. Chem. I, Karolinska Inst., Stockholm.) 1 and 2 (Not abstracted.)—3. Two groups of chick embryos from hens on the vitamin-B_{12}-deficient diets of Yacowitz *et al.* (Abst. 535, Vol. 22), one high and one low in protein were found to contain about one-tenth as much of the vitamin as embryos from hens given a supplement of 1 mg. vitamin B_{12} per 100 g. diet. In the second group, weight and deoxyribonucleic acid (DNA) content of the embryos were lower than those of non-deficient embryos. When uniformly labelled cytidine-^{14}C, deoxyuridine-2-^{14}C and thymidine-2-^{14}C were incubated with minced embryos, no significant difference between deficient and non-deficient was found in incorporation of cytidine into ribonucleic acid pyrimidines or DNA deoxycytidine. Incorporation into DNA thymidine by the deficient cells was only half that of non-deficient, but was increased by addition of vitamin B_{12} *in vitro*. Mince from deficient embryos also incorporated less deoxyuridine-^{14}C into DNA thymidine than did that from controls, and addition of vitamin B_{12}

again had a stimutating effect. Neither deficiency nor addition of vitamin B_{12} affected incorporation of thymidine-^{14}C into DNA thymidine. It is considered that these results indicate that vitamin B_{12} is required for the reactions connected with the methylation of uracil but not for those connected with deoxyribose synthesis.—A. Crossland. (Nutrition Abstracts & Reviews)

RHODES, M. B., N. BENNETT, and **R. E. FEENEY.**

THE FLAVOPROTEIN-APOPROTEIN SYSTEM OF EGG WHITE. *J. Biol. Chem.*, 1959, 234, 2054-2060. (Dept. Biochem. Nutrit., Coll. Agric., Univ. Nebraska, Lincoln.)—The flavoprotein and apoprotein of egg white were isolated and purified by adsorption first on diethylaminoethyl cellulose and then on carboxymethyl cellulose. The total average amount of such protein was 0.8 per cent., dry basis, half as flavoprotein and half as apoprotein. The isolated flavoprotein had properties similar to that formed by combining riboflavin with the apoprotein, and all the riboflavin in egg white was bound as flavoprotein. Analogues of riboflavin also formed complexes with the apoprotein, but these were bound less strongly than riboflavin. The calculated molecular weight of the flavoprotein by ultracentrifugal analysis was 36,000 and by flavin binding 32,000. The P content of the protein was from 0.7 to 0.8 per cent. and P was enzymically released by potato acid phosphatase without effect on the capacity to bind flavin. The flavin-binding capacity was destroyed by proteolytic enzymes.

The riboflavin content of egg white is known to be greatly reduced when the riboflavin in the diet of the hen is low (Norris and Bauernfeind, Abst. 3417, Vol. 10), but the content of flavoprotein and apoprotein was not decreased. It was found that substitution in the 3 position of *iso*alloxazine decreased the binding of flavin, but even greater decreases occurred when the substituents in the 9 position were changed.—A. Crossland. (Nutrition Abstracts & Reviews)

ROY, D. N., S. H. LIPTON, F. M. STRONG, and **H. R. BIRD.**

POTENTIATION OF LATHYROGENIC EFFECT OF BETA AMINOPROPIONITRILE IN TURKEY POULTS. *Proc. Soc. Exp. Biol. Med.*, 1959, 102, 767-770. (Dept. Biochem., Univ. Wisconsin, Madison.)—Day-old turkey poults in groups of 10 were given a practical starting mash alone or with 0.026 or 0.053 per cent. β-aminopropionitrile fumarate (BAPN) or 0.024 to 0.24 per cent. cyanoacetic acid, or BAPN with other substances.

BAPN produced the expected toxic effects but cyanoacetic acid produced none although serum values were more than twice those obtained with BAPN. The toxicity of BAPN was increased by *iso*nicotinic acid hydrazide given at the same time and also by 1-*iso*nicotinyl-2-*iso*propyl hydrazine and *n*-propylamine, although these substances by themsleves were not toxic. They were thought to depress the conversion of BAPN to cyanoacetic acid.—D. Duncan. (Nutrition Abstracts & Reviews)

RUSSO, J. M., and **V. HEIMAN.**

ABILITY OF CORN FERMENTATION CONDENSED SOLUBLES TO REPLACE UNIDENTIFIED GROWTH FACTOR SOURCES FOR CHICKENS. *Poultry Sci.*, 1959, 38, 1324-1328. (Animal Nutrit. Dept., Corn Products Co., Waverly, N.Y.)—In the first 4 experiments with day-old chicks the control ration, with 23 per cent. protein, was a practical commercial one containing 4.5 per cent. fishmeal, with 1382 Cal. metabolisable energy per lb. and believed to be adequate in all known nutrients. Omission of the fishmeal, but with the protein and mineral content adjusted, resulted in a significant average decrease of 3.3 per cent. in growth to 28 days of age. When 5 per cent. maize fermentation condensed solubles was added to the ration without fishmeal, with the protein and mineral content again adjusted, the rate of growth increased by 7.5 per cent., and by 4.5 per cent. when compared with the control ration, both increases being significant. Omission of the fishmeal depressed feed efficiency by 4.8 per cent.,

and addition of the maize solubles to the ration without fishmeal improved efficiency but not to the level of that of the control group.

In a second series of experiments a U.S. National Research Council reference chick ration was used as control. Omission of fish solubles and dried whey from this ration caused, over 28 days, a significant decrease of 6.1 per cent. in rate of growth. When 5 per cent. maize fermentation condensed solubles was added to the ration containing neither fish solubles nor whey, growth rate was restored to the level of that on the control ration. Feed efficiency was significantly reduced, by 1.6 per cent., when the fish solubles and whey were omitted but was restored to that of the control group when maize solubles was added. —J. S. Thomson. (Nutrition Abstracts & Reviews)

SCHNEIDER, B. H., I. A. KHAN, M. SALEEM, and **M. SHAFIQ.**
AUREOMYCIN (CHLORTETRACYCLINE) AND ARSANILIC ACID IN RATIONS FOR GROWING CHICKS. *Agriculture Pakistan*, 1959, 10, 291-298. (Coll. Animal Husb., Lahore.)—In 3 experiments with groups of from 40 to 100 chickens grown from day-old to 12 weeks chlortetracycline 5 or 10 g. or arsanilic acid 90 g. per ton feed or both were added to a basal ration. In only one experiment, with the higher level of antibiotic, was growth significantly improved by the addition. There was no significant reduction in feed required per lb. gain. It is concluded that under present conditions in Pakistan other improvements in feeding and management should be made before the use of these growth stimulants will be of practical value.—T. D. Bell. (Nutrition Abstracts & Reviews)

SCOTT, M. L., E. R. HOLM, and **R. E. REYNOLDS.**
STUDIES ON THE NIACIN, RIBOFLAVIN, CHOLINE, MANGANESE AND ZINC REQUIREMENTS OF YOUNG RINGNECKED PHEASANTS FOR GROWTH, FEATHERING AND PREVENTION OF LEG DISORDERS. *Poultry Sci.*, 1959, 38, 1344-1350. (Dept. Poultry Husb., Cornell Univ., Ithaca, N.Y.) For previous work see Abst. 6805, Vol. 29.—As a result of a further series of experiments with Ringnecked pheasants the following requirements in mg. per kg. ration are suggested for optimum growth, good feathering and freedom from perosis and hock enlargement: nicotinic acid 70, riboflavin 3.4, Mn 70 to 95, Zn 62. The basal ration had 1430 mg. choline per kg. and further additions had no beneficial effect.

Deficiency of nicotinic acid produced a high incidence of enlarged hock and gave poor feathering. Deficiency of riboflavin affected growth rate and induced curled toe paralysis. Deficiency of Mn did not affect growth but gave a high incidence of perosis. Deficiency of Zn did not affect growth but there was high mortality and a high incidence of enlarged hock.—J. S. Thomson. (Nutrition Abstracts & Reviews)

SMETANA, P., and **D. K. GILES.**
CHRISTMAS ISLAND ROCK PHOSPHATE IN POULTRY FEEDING TRIALS. *J. Agric. W. Austral.*, 1959, 8, 467-470; 473-475.—The Christmas Island rock phosphate studied had Ca 35.6, P 16.6 and F 1.35 per cent. In rearing and laying trials it was added as 2 per cent. to basal ration already containing suficient Ca and P. There was no harmful effect of the F on growth, mortality, egg production, fertility or hatchability, and no clinical sign of fluorosis was seen. In one rearing trial 4 per cent. rock phosphate was given, and F in bone ash was twice as much as that in control birds. This high level is not recommended, but the rock phosphate is considered a suitable source of Ca and P for poultry rations.—T. D. Bell. (Nutrition Abstracts & Reviews)

SQUIBB, R. L., and **J. E. BRAHAM.** La harina de sangre como suplemento de lisina en raciones para polluelos compuestas solo de proteinas vegetales.
BLOODMEAL AS A LYSINE SUPPLEMENT TO ALL-VEGETABLE PROTEIN RATIONS FOR CHICKENS. *Bol. Ofic. sanit. panamer.*, 1959, Suppl. No. 3, 228-231. (Inst. Agropecuario Nac., Guatemala City.) (Nutrition Abstracts & Reviews)

SQUIBB, R. L., J. E. BRAHAM, and **N. S. SCRIMSHAW.** Absorcion de vitamina A en soluciones acuosas y en aceite por polluelos depauperados de la raza New Hampshire.
ABSORPTION OF VITAMIN A IN AQUEOUS AND OIL SOLUTIONS BY DEPLETED NEW HAMPSHIRE CHICKS. *Bol. Ofic. sanit. panamer.*, 1959, *Suppl.* No. 3, 232-234. (Inst. Agropecuario Nac., Guatemala.) (Nutrition Abstracts & Reviews)

TEEKELL, R. A., and **WATTS, A. B.**
MOLYBDENUM SUPPLEMENTATION OF CHICK DIETS. *Poultry Sci.*, 1959, 38, 1127-1132. (Louisiana State Univ., Baton Rouge.) For previous work see Abst. 716, Vol. 30.—The chickens used were from dams which had received either a ration supplemented with tungsten to induce Mo deficiency, or a non-supplemented ration. The chickens were fed for 20 days on a purified ration or a practical ration each alone or supplemented with from 1 to 1000 or 2000 p.p.m. Mo. Analysis of the newly hatched chickens showed that there was a large carry-over of tungsten from the dams which received tungsten, the kidney and liver containing 7.21 and 1.78 p.p.m., respectively, compared with 2.75 and 0.79 p.p.m. in chickens from dams receiving no supplement. The Mo content of the carcases was similar in both groups.

With the purified ration chickens from hens given tungsten supplement showed a significant or highly significant increase in weight when up to 100 p.p.m. Mo was added. With higher amounts toxicity was evident, the toxic threshold lying between 100 and 500 p.p.m. Efficiency of feed conversion was not affected by 1 to 3 p.p.m. Mo, but was improved by 5 to 100 p.p.m.; still higher levels decreased it. With chickens from hens without supplement growth and feed efficiency on the purified ration were not affected by Mo supplements up to 500 p.p.m. but higher amounts were deleterious. Although the combined average growth data for all levels of Mo showed that the chickens from dams without supplement grew significantly faster than those from the dams with supplement, best growth was obtained in chickens from dams receiving tungsten and 10 or 50 p.p.m. Mo and a synergistic relation between tungsten and Mo is postulated.

With a practical ration the addition of 1 to 10 p.p.m. Mo significantly increased the rate of growth of chickens from dams which had had a tungsten supplement but it was depressed with 500 or 1000 p.p.m. The addition of up to 100 p.p.m. Mo to the ration of chickens whose dams had not received a tungsten supplement had no effect on growth but levels of 500 to 1000 p.p.m. depressed it. Feed efficiency was adversely affected only at the 2 highest levels in each group.

Th addition of Mo had no effect on xanthine oxidase in liver and kidney as estimated by uric acid synthesis. Alkaline phosphatase in liver and kidney tended to rise as the level of Mo rose until at toxic levels the values were about twice those for chickens receiving no Mo. Bone ash was not affected by the Mo supplements.—J. S. Thomson. (Nutrition Abstracts & Reviews)

TENNENT, D. M., M. E. ZANETTI, H. SIEGEL, G. W. KURON, and **W. H. OTT.**
THE INFLUENCE OF SELECTED VEGETABLE FATS ON PLASMA LIPID CONCENTRATIONS AND AORTIC ATHEROMATOSIS IN CHOLESTEROL-FED AND DIETHYLSTILBESTROL-IMPLANTED COCKERELS. *J. Nutrition*, 1959, 69, 283-288. (Merck. Inst. Therap. Res., Rahway, N.J.)—Cockerels 8 weeks old were given for 8 weeks a diet of maizemeal, soya bean meal, fishmeal, alfalfa meal, vitamins and minerals, with 5 per cent. of a vegetable fat and 2 per cent, cholesterol. The total fat content of the diet was 8.2 per cent.: 22 per cent. of the total energy was derived from fat. Some birds with diethylstilboestrol implants received no cholesterol. There was a close relation between the plasma lipid pattern and the composition of the fat in the diet. Cottonseed oil, which contains 50 per cent. linoleic acid, produced high plasma lipid concentrations, and so did cocoa butter and olive oil, but linseed and safflower oils produced low concentrations.

Plasma cholesterol was inversely proportional to the percentage of polyenoic acids in the fat; lipid P was inversely proportional to the total amount of unsaturation. The severity of aortic lesions was not closely related to the composition of the fat, but cottonseed oil consistently induced a high incidence of lesions. Increased concentrations of cholesterol, of endogenous origin, and of lipid P were found in the plasma of cocks treated with stilboestrol, but the type of fat had little effect on these or on the severity of the aortic lesions, which developed more slowly than in birds given cholesterol.—E. M. Cruickshank. (Nutrition Abstracts & Reviews)

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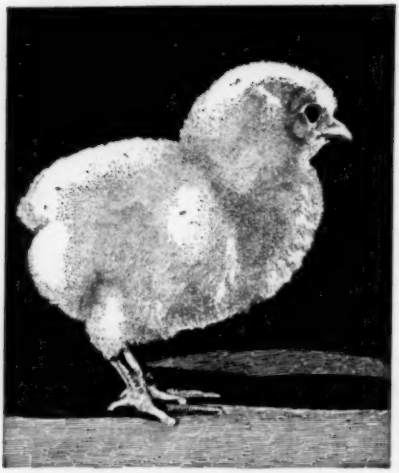

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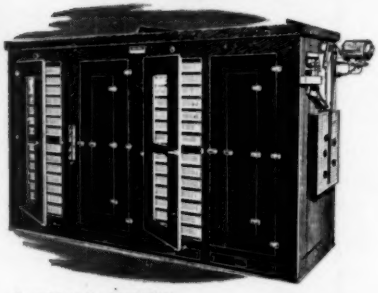

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● FLESHING ● BLACKHEAD PREVENTION

Once again Dr. Salsbury's Histostat-50 has been proven to prevent blackhead best and to provide other benefits needed by turkeys for fast, profitable gains. The following is taken from the "1959 TURKEY DISEASE CONTROL REPORT," University of Minnesota, Northwest School and Experiment Station, located at Crookston, Minnesota. It is reprinted here to give you factual data on a series of tests that are important to everyone connected with the turkey industry.

WEIGHT, FEED EFFICIENCY, FINISH, AND MORTALITY DATA

Lot Number	1B	2B	3B	4B	5B	6B	7B	8B
Drug Treatment	None	1 lb. Histostat 50	1 lb. 11 oz. Hepzide 30	2 lb. 5 oz. Hepzide 30	2 lb. NF 64	3 lb. NF 64	3 lb. NF 179	2 lb. NF 180
Average Weight Toms, Lbs.	21.96	22.94	21.81	21.95	22.47	21.49	23.44	23.05
Average Weight Hens, Lbs.	15.13	15.58	14.99	15.01	15.72	15.28	15.54	14.74
Feed Required Per Lb. Gain	5.08	4.17	4.67	4.32	4.63	3.91	3.98	4.48
Feathering—Toms.	93.75	98.75	94.44	100.00	100.00	89.29	98.96	97.50
Hens	100.00	100.00	100.00	100.00	98.75	98.86	100.00	99.00
Fleshing —Toms.	84.38	96.25	90.28	84.38	92.30	80.95	92.71	88.75
Hens	100.00	100.00	100.00	100.00	98.75	98.86	100.00	98.00
Mortality Blackhead, %	24%	2%	12%	10%	22%	14%	4%	12%

Please note the consistent superiority of lot 2B (Histostat-50). This lot had the *lowest death loss*, and was *highest of all the commercially available drugs tested on weight gains, feed efficiency*, and *fleshing*.

As an educational staff member or research worker, you may wish further information about Histostat-50 or some other of Dr. Salsbury's many fine products or services. Please phone, write, or wire. Your inquiry will get a prompt reply.

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